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FARMERS DIGEST

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COLLEGE OF AGRICULTURE
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The Farmer's Digest

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The Farmer's Digest

Volume 8 December, 1944 Number 7

Thomas Jefferson's Land Practices

Condensed from Land Policy Review

Helen L. Eddy

IT IS well known that many of those who have made major contributions to the creation and development of our Nation were close to the land and intimately acquainted with farming problems. This was especially true in colonial days when farming was the main occupation. Colonial Virginia was predominantly agricultural and the main body of its citizens were large landowners. Although many of these men practiced a profession such as law, medicine, or surveying, or served as members of the governing bodies, much of their time was devoted to the management of their estates, which furnished their chief source of income. Outstanding among this group of Virginia planters was young Thomas Jefferson.

Because of the early death of his father, as soon as Jefferson became 21 he was responsible for the management of the estates for the whole family. In addition, he continued to study law under George Wythe, one of the most eminent legal minds of his generation, and was admitted to the bar of Virginia in 1767. Two years later he became a member of the House of Burgesses representing the district of Shadwell. Thus far Jefferson was the typical young Virginia planter, supervising his estates, practicing law, and engaging in political activity —but here the similarity ends. Jefferson's love of nature coupled with his scientific bent and his training at the College of William and Mary, caused him to regard farming as more than an occupation or a source of income—to him it became a field for experimentation and a valued way of living.

His own estate through inheritance, marriage, and purchase comprised more than 10 thousand acres. About half that acreage was located in Albemarle County where he had five large farms—Shadwell, the birthplace, Lego, Pantops, Tufton, and Monticello his own home. The land was rolling clay loam with the best portions along the Rivanna River. Most of Monticello was too steep

Reprinted from the Land Policy Review, Washington, D. C.

for cultivation and he wisely left the wooded mountain slopes in their natural state. He leveled the top of the mountain for his lawn and gardens and terraced the upper slope facing the south to use as an orchard and vineyard.

During the Revolution and the decade following, Jefferson's public services left no time for the personal management of his farms. But his love of farming was deep-seated and not a youthful enthusiasm. He constantly gathered information about crops and implements he thought might further the agricultural activities of others in the United States. He explained his viewpoint to William Drayton in 1786, saying, "We are probably far from possessing as yet, all the articles of culture for which nature has fitted our country. To find these out, will require abundance of unsuccessful experiments. But if, in a multitude of these, we make one useful acquisition, it repays our trouble." Consequently he went to great pains to secure plants and seeds as well as agricultural pamphlets to forward to his friends.

His long absences from home forced him to rely upon overseer management with the usual results of reduced crop yields, soil deterioration, and erosion. The farm economy of colonial Virginia called for continuous cropping of corn and tobacco—corn to feed to stock and servants, and tobacco for cash—until the soil was exhausted. Then new fields were cleared, the old abandoned, and the same planting system employed as before. To add to the general havoc the plowing was done up-and-down slope, thus increasing the tendency of the soil to wash. Jefferson's lands were no exception. Upon close examination he discovered that "a 10 year's abandonment of them to the ravages of overseers" brought them "to a degree of degradation" beyond his expectations.

Jefferson determined to restore his depleted fields by a change in the system of farming. His first step was to substitute potatoes, clover, and sheep for the customary corn and hogs. He had learned of the value of clover and sheep in maintaining soil fertility from Arthur Young, the great English agricultural publicist. He adopted the following 7-year rotation based on the division of each farm into seven fields:

1. Wheat, followed the same year by turnips, to be fed on by the sheep.
2. Corn and potatoes mixed, and in autumn the vetch to be used as fodder in the spring if wanted, or to be turned in as a dressing.
3. Peas or potatoes, or both, according to the quality of the field.
4. Rye and clover sown on it in the spring. Wheat may be substituted here for rye, when it shall be found that the second, third, fifth, and sixth fields will subsist the farm.
5. Clover.
6. Clover, and in autumn turn it in and sow the vetch.

Beef Cattle Do Better on Silage

Condensed from The Southern Planter

Fred H. Leinbach
University of Maryland

THERE is only one source of income from the beef cow herd—the sale of calves. Irrespective of what the ultimate disposal of the calves may be, their cost at weaning time largely determines the degree of success in the whole beef undertaking. Two major factors which determine the cost at weaning time are (1) the percentage of calves raised in relation to the number of cows in the herd and (2) the cost of feeding the cows themselves over the year-round period.

Low calf crops may be caused by one or a number of contributing factors. Improper feeding of breeding stock is one. In feeding the cow herd, therefore, it is necessary to consider not only the cost of the ration to be fed, but also its adequacy in supplying all essential food elements in proper quantities. Fortunately, to devise such a ration, using homegrown feeds, does not create too difficult a problem.

We can readily divide the beef cow year into two periods—pasture and winter feeding. The longer the pasture season the shorter the winter feeding period and, ordinarily, the lower the cost of feeding for the year. In beef production it is absolutely essential that maximum utilization be made of pastures and almost equally as essential that pastures be made to yield their maximum economical yields. We tend to neglect our pastures, often failing to realize that pasture grass is one of the most profitable crops we can raise when cared for in the proper manner. Pasture feeding being cheaper than winter feeding, good herd management will emphasize a pasture season extended over as long a period as possible.

Since beef cows make good utilization of such roughage feeds as hay and silage and, too, since these feeds are ordinarily cheaper than such concentrates as small grain, corn or protein supplement, a good winter ration will contain a maximum amount of the roughage feeds and only enough of the latter kinds to make up any deficiencies in essential nutrients. But, there is a vast difference in the cost of the

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various roughage feeds. Corn silage is ordinarily a much cheaper roughage than hay. This would indicate a maximum utilization of silage in the winter feed period of beef breeding cows, and a minimum use of the more expensive hay.

During the past season an experiment was conducted at the University of Maryland to determine whether corn silage could be used as the sole roughage in wintering pregnant beef cows. Two similar groups of cows, made up of heifers carrying their first calves and older cows up to 8 and 9 years of age, were fed as follows:

Those in Lot 1 received a ration of clover, light timothy hay and a mineral mixture of 50 per cent salt, 25 per cent ground limestone and 25 per cent steamed bone meal during the dry period. They were fed all the hay they would clean up, and the minerals were fed free choice. After calving the nursing cows and their calves were turned into a separate lot and continued on hay and minerals. In addition these cows were fed 4 pounds of crushed barley and 2 pounds of corn gluten feed daily per cow during the remainder of the test.

Cows in Lot 2 were fed a ration of silage supplemented with sufficient soybean oil meal (.82 pounds daily per cow) and ground limestone (.1 pound daily per cow) to make up for the deficiencies of the ration in protein and calcium, together with the same mineral mixture as Lot 1, fed free choice. After calving these cows and their calves were placed in a separate lot and continued on silage, soybean oil meal, lime and minerals and were fed in addition 4 pounds of crushed barley and 2 pounds of corn gluten feed daily per cow.

The calves in both lots were creep-fed a grain-alfalfa hay mixture during the first part of the test and on a grain mixture the last part of the test.

Although the two lots were comparable in weight, condition, vigor and age when the test began, the silage fed cows were far ahead in weight, condition and calves were approximately 10 per cent heavier at birth and had gained more rapidly.

The results, though preliminary, would indicate that pregnant cows can be satisfactorily fed a roughage ration of corn silage alone when the ration is supplemented with small amounts of protein and calcium. Also, from the standpoint of economy, such a feeding practice is desirable. No bad effects were obtained from heavy silage feeding either with the younger or with the older cows. Results measured from all angles favor the heavy silage feeding.

Injuries That Cause Udder Troubles

Condensed from American Agriculturist

C. L. Dickinson

NATURE provided cows equipment designed to work best out of doors. Relatively small feet with sharp hooves are built to get a firm footing on rough ground. When a cow lies down in the pasture, she finds a smooth spot where she has plenty of room to maneuver. Getting up and down is a major moving job for a big, heavy cow. She knows it and chooses her location with care.

The next time you see a cow lying down, watch her carefully when she gets up and I think you will see why so many cows get their teats stepped on in the cement floored stables.

First, she shifts her weight to the hind leg and foot on her *under* side. She pushes up with this leg while she gets the top hind leg in position to carry its share. Then, she boosts with both hind legs until she is standing on her front knees. When she straightens her front legs—lo and behold, the job is completed and she's up.

If the foot on the under side should slip while she's maneuvering into position, she brings the foot on the top side up closer to her body to catch her balance, and that's where the trouble starts. There's a better-than-even chance that she'll come down with that foot right on some part of her udder—often the end of a teat. When that happens, it usually means the end of the cow as a profitable producer.

During the winter months, when a cow's only bed is a narrow stall on a raised concrete platform, there isn't much opportunity for choosiness in selecting a place to lie down. Lock her head in a tight or slightly movable stanchion, and the process of lying down and getting up becomes a real feat.

If the concrete platform is smooth and the cushion of bedding has slid into the gutter or over into the next stall, there just isn't anything to prevent that leg on the under side from slipping. That's when the teat gets stepped on.

A simple method of keeping bedding material in place on the stall platforms is being used by some dairymen who have reduced udder injuries by it. Under each stall partition they fasten a two by four that lies flat on the platform between the manger and

Reprinted by permission from the American Agriculturist, Ithaca, N. Y., Oct. 7, 1944

the gutter. This makes a shallow box for each cow and most of the bedding will stay in place inside the box. While this simple device isn't foolproof, it helps to cut down on the injuries caused by cows stepping on their own teats.

The point of this discussion is how to cut down on udder injuries that reduce the resistance to mastitis.

Some injuries that cause serious udder trouble are not as easy to discover as a teat that has been stepped on.

Bruises and colds reduce resistance to udder trouble. Germs in a healthy udder haven't much chance to multiply and cause trouble. The problem is to prevent the injuries that give the trouble making germs a chance to go to work.

I have been in many dairy barns where I've noticed that the platforms are too narrow for the big cows. These narrow platforms are real troublemakers. Some dairy farmers I know have helped to solve this problem by making a few stalls longer and wider to give the big cows more "living" room.

Cold drafts sometimes contribute to udder trouble. I know of one barn where the cows in a certain two stanchions always seemed to have udder trouble. These two stanchions were directly opposite the silo chute door. The door was usually left open to provide for ventilation of the stable. It so happened that a cold draft created by the open chute door passed right through the two stanchions and caused plenty of udder trouble. When the owner discovered this, he kept the chute closed and the trouble stopped.

If you've been having some udder trouble, study your stable and see if there are any special areas in the barn where trouble is most apt to occur. Then, look around for the cause—an open door or a hay or silo chute that creates a draft may be the cause.

Watch the cows when they lie down. If their udders hang over the edge of the platform, see if you can provide a bigger "living room." If the teats get stepped on, try building a bedding retainer of two by fours between stalls.

Close observation in your own stable may lead to the discovery of other causes of lowered resistance to udder troubles. Eliminate the causes of lowered resistance to udder trouble and the battle will be almost won.

Getting Higher Egg Production

Condensed from Everybodys Poultry Magazine

C. E. Lee

EVERYTHING points to the fact that poultrymen, if they have not already done so, must begin now to check and double check on their management practices to see that they are operating at top efficiency.

Feed costs are more in relation to the prices of eggs than they have been for several years, and when the war is over, we may have a real problem of overproduction of eggs and poultry meat.

Every effort of organizations, such as the New England Poultry & Egg Institute, the Poultry & Egg National Board, feed manufacturers, and others will be directed at maintaining the present high consumption of eggs and poultry attained during the war, but it seems very doubtful whether all these agencies together can manage to maintain the present heavy consumption when rationing is removed and people are once more able to buy all kinds of meat freely.

If we have serious unemployment, it will be especially difficult to hold the consumption level. People buy eggs and poultry most freely when employment and wages are high, and they buy far less of our products when employment is down. The shift to cheaper foods, to a higher carbohydrate diet, always comes with a drop in employment or wages. We can argue about the merits and demerits of the matter from a nutritional standpoint, but when the public has less income, it buys more of the cheap foods (cheap in first cost, not in actual nutritive cost) regardless of what anyone advises.

The need for greater efficiency then is clear. The question is, what are we going to do about it? Many things probably will be done to enable more birds to be kept per man, but in our opinion, that is not likely to be the most profitable method to use for increasing profit. Chances are, much more labor will be available, and we will have to worry less about getting adequate help at reasonable cost. What we will have to worry about is getting a higher egg production.

A little higher egg production has a tremendous effect on profit. After all, it costs about so much to raise a pullet, and it costs about so much to house a bird, to care

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for her during the year, to furnish the necessary light and feed and litter. To be sure, she will eat a little more feed if she lays a lot of eggs, but the difference is not in proportion.

The 4-pound Leghorn laying 100 eggs per year will eat about 70 pounds of feed, while she can lay 150 eggs and still eat only about 78 pounds of feed. If she lays 200 eggs, she'll consume only about 85 pounds of feed, so the difference in feed consumption just isn't worth considering; the gain is so much more than the cost.

This more than proportionate gain is well shown by the last New York State survey of commercial poultry farms, made by Dr. Darrah of Cornell University. Dr. Darrah discusses the effect of higher production as follows in Cornell Bul. 803:

"The farms that produced less than 160 eggs per layer had 1,157 layers and 634 work units per farm. The average labor income was $1,289. The farms with 160-179 eggs per layer had more layers but fewer work units than the first group. The labor income, however, was $1,665, or about $400 more per farm than for those with less than 160 eggs per layer. The farms that produced more than 179 eggs per layer had approximately the same size of business as had the farms that produced less than 160 eggs, but had an average labor income of $1,905, or about $600 more per farm than had those with low rates of egg production. An increase of 12 eggs produced per layer was accompanied by an increase of $157 in labor income."

We all realize that better feeding is a profitable thing. When the yearly average price for eggs is, for example, 35 cents per dozen, a feed that would produce even nine more eggs per bird per year would be worth $13.13 more per ton for the better mash. At 12 extra eggs per bird per year, the better mash was worth $17.50 per ton more, and even if only three more eggs were produced it was worth $4.38 per ton extra.

It doesn't take much increase in nutritive value and biological efficiency in a mash to give an extra dozen eggs per bird per year; that is obvious.

What is not so obvious is that the way we use that feed after we get it may determine whether we get all the extra eggs out of it or only part of them or none at all.

Sometimes we overlook the common, everyday things which can be done to improve production. The most obvious things are sometimes the ones we are least likely to see.

At Cornell University back in 1918, the high production and low production breeding lines which were being developed by the university in order to demon-

strate what can be done for egg production by breeding, were housed in pens which accommodated about 35 hens. Mash was provided in metal hoppers which hung on the wall, and these hoppers had only five holes through which the birds could eat.

In 1918 these hoppers were replaced with mash troughs that were 4 feet long, and these were on legs so that the birds could eat from both sides. The 35 hens, therefore, were provided with 8 feet of feeding space, or at the rate of about 23 feet of feeding space per hundred birds.

It is interesting to note that the high production line showed an increase of more than 30 eggs per bird. If this had been obtained by a change in the mash, it would have enabled a poultryman to pay $43.75 per ton extra for such a mash at a 35 cent per dozen price for the eggs he sold, but it was obtained simply by giving the birds more hopper space so that they could eat more comfortably and with less competition.

At the State Institute of Agriculture on Long Island (Farmingdale) in 1924, we had a somewhat similar experience. One of the Institute laying houses on the experimental plant was a 20 by 40 laying house built on the old Jersey plan. This house was divided into two 20 by 20 pens each carrying, at the time, 125 Leghorn pullets. The pullets in these pens were of the same breeding, rearing, and were selected for as uniform maturity as possible at the time they were housed. Egg production had been running along at practically the same level in both pens.

One of the courses given at the Institute was that in "farm practice." This required students to report at 6 A.M. for a routine feeding, care of the incubators, etc. Members of the department staff alternated in supervising this work. On several occasions when the writer was on hand for this supervision in the early morning, he noticed the congestion around the mash hoppers in the laying houses.

The situation in the house mentioned above was typical of that in many other houses. The single mash hopper in this two pen 20 by 40 house was the old Cornell storage type of hopper built into the partition between the two 20 by 20 pens. This hopper was about 5 feet long and held about 500 pounds of mash. Each 125 birds, therefore, had exactly 5 feet of actual feeding space.

After noting this congestion for some time, we decided that it might be a good idea to try using some additional hopper space, so we added two five-foot mash troughs in one of the 20 by 20 pens. This, of course, provided a

total of 25 feet of actual feeding space, including the old equipment, for the 125 birds in that pen. The other birds were left with the old 5-foot arrangement.

Within a few days, the birds in the pen with the extra hoppers had increased production so that they were substantially ahead of the birds in the other pen. This increase continued until the birds having the extra hoppers were laying steadily at better than 20 per cent ahead of the other flock.

After this had continued for a few weeks, we decided to reverse the hopper arrangement, giving the extra hoppers to the other pen and reducing the high pen to the old 5-foot standard. This was done, and within a short time the production in the pens was just reversed from what it had been. This led to adding additional mash hoppers in every pen throughout the plant, with great benefit to the production and particularly the reduction of the percentage of culls.

Professor Sanctuary at Massachusetts State College, and other investigators, have shown that a "pecking order" develops among any considerable group of birds. This is more and more noticeable as the necessity for competition increases. In other words if birds have an abundance of mash hopper space, there is room for all birds to eat and it is virtually impossible for a few dominant birds to keep the less aggressive ones away from the feed, but when hopper space is reduced, then the dominant birds get plenty of feed and the rest do not, with the result that the less aggressive birds decline in production rapidly and become unprofitable.

It is not only mash hopper space which is important, but also floor space in the laying house. Indirectly, this is often associated with the ventilation system, the supply of fresh air available.

In 1923 a poultryman near Ithaca decided to try the effect of giving the birds more floor space. This particular poultryman had an excellent strain of Leghorns which he bred himself. Most of his laying houses carried birds at the rate of one bird to each three square feet of floor space. One house, however, was given over to an experiment, only one bird to each four square feet of floor space being housed.

Throughout the year, production was superior in this house and mortality was lower. Furthermore, the percentage of culls was less. Again it was demonstrated that a comparatively simple change would yield surprising results in better egg production and greater profit.

We have no actual figures on the effect of more water space, but eggs are largely water, and it

How Egg Production Per Bird Affects Labor Income

(Survey by Dr. Darrah, Cornell University)

Eggs Produced Per Layer Range Number	Average Number	Farms Number	Layers Number	Man Equivalent Number	Work Units Number	Labor Income Dollars
Less than 160	145	44	1,157	2.4	634	1,289
160-179	170	39	1,300	2.1	533	1,665
More than 179	194	37	1,120	2.4	611	1,905
Total or Average	168	120	1,192	2.3	594	1,601

is obvious that plenty of water space is highly important in securing highest egg production.

At the Research Farm we did have a demonstration some years ago. A laying battery had been installed which had a water system of a new type. A group of pullets was put into the battery and came into production very shortly. After getting up to a very moderate level of production, they ceased to gain. It was obvious that something was wrong, but for some time we were unable to find the trouble. Finally, we did find that the new water system was not delivering enough water to the birds.

We finally had to build some small V-shaped troughs and put them on the battery so that the birds would be supplied with enough water. This was done on one side of the battery at first, and immediately production jumped up and stayed there. When these new troughs were finally put on the other side of the battery, the same thing happened. It was as dramatic an illustration of the importance of plenty of water as could well be imagined.

Undoubtedly, many flocks do not get enough water, primarily because there is too little water fountain space, permitting only a few birds to drink at one time. The dominant birds get plenty of water, while the less aggressive birds get very little, with consequent increase in the number of culls and decrease in the egg production.

No flock is going to give maximum egg production if the birds are packed in the corners of the pen at night instead of up on the perches where they can roost comfortably or if some of them are attempting to force their way up on the already overcrowded perches, as long as there is light enough for them to see to make the attempt.

There are no statistics to indicate the actual loss of egg production from many of these things, but we do know that as

a broad general principle, birds should be made reasonably comfortable, that it doesn't pay to excite them, to irritate them, to make them fight for room to eat or work or drink or sleep.

There still does not exist any definite proof as to the upper and lower limits of mash hopper space, floor space, water space, or roosting space per bird.

The Committee on Nutrition of the American Feed Manufacturers Association has started some investigations and it is believed that within another year, there will be some reports available to indicate some of these limits. The following is based upon the recommendations of this committee. How does it check with your own practices?

Have You Met These Standards?

	LIGHT BREEDS	HEAVY BREEDS		
FLOOR SPACE	At least 3½ sq. ft. per bird	At least 4½ sq. ft. per bird	☐ Yes	☐ No
FEEDING SPACE	Minimum of 36 feet per 100 birds		☐ Yes	☐ No
WATER SPACE	Two 3 to 5-gallon waterers per 100 birds or one automatic jet or float type waterer		☐ Yes	☐ No
ROOSTING SPACE	At least 7 in. per bird	At least 8 in. per bird	☐ Yes	☐ No

Soils Take a Rest

Condensed from The Scientific Monthly

Dr. William A. Albrecht

Chairman, Dept. of Soils, University of Missouri

PLANT growth has been so long accepted by the human race as a matter of course that the continuous functioning of the soil in producing it—if recognized at all—is seldom questioned. Recent concepts of the mechanism of plant nutrition as an exchange between the nutritive ions adsorbed on the surface of the clay particles and the hydrogen or other ions on the plant roots are explaining crop failures and lowered yields in terms of deficiency of available nutritive elements. Such unproductive soils are taking a rest.

The dozen or more chemical elements coming from the soil for plant construction originate in the rock minerals that form the soil. The sand and the silt fractions are rock particles and crystalline minerals not yet decomposed, while the accompanying clay is a seemingly formless product of the rock's chemical change. Clay has little in its molecular structure to contribute to plant nourishment by its own breakdown. But as adsorbers and exchangers of nutrient ions most clays are very effective because of the tremendous surface of their particles. Clay serves as the "jobber" to give its adsorbed nutrients to the plants for hydrogen taken in exchange. It then passes this acidity to the silt and other minerals to break them down and accept in its place those nutrient elements so obtained from these rock crystals. It is by this mechanism that nutrients are passing from the rock minerals through clay to the plant. Hydrogen as acidity from root growth is passing in the opposite direction. Plants are thus continually exhausting the city's stock of plant nourishment. It is this exhaustion that produces the phenomenon of resting soils.

Recent plant-soil studies using clay only for plant support showed that a single crop removed the supplies of adsorbed nutrient elements from the clay to an extent ranging from 25 to 85 per cent. Of those elements tested, adsorbed potassium was most rapidly and completely removed. The concentration of acidity or hydrogen on the clay

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had gone up as the nutrients went down.

These facts point out clearly, then, that after one crop has taken most of the nutrient ions from the clay there could be little on the clay for a crop following immediately. A clay so nearly exhausted then takes a rest from plant production while it restocks itself with nutrient ions from the less active rock particles. It rests from crop production but is active in getting rid of acidity and taking nutrients by weathering the reserve minerals.

The fall and winter seasons are rest periods of the soil. Low temperatures rule out crop growth but not these beneficial chemical reactions in the soils. Time intervals between crops at seasons other than winter serve similarly. These needs for the soil to take a periodic rest from crop production as indicated by crop failure following immediately after another crop have sometimes been interpreted as injurious or poisonous effects by one crop on another following it too closely. The so-called crop injury has been simply a case of starvation for the soil-borne nutrients. Early plowing in the summer for fall-seeded wheat is a method of hastening recovery from nutrient exhaustion, once explained as moisture accumulation and restocking of the exhausted clay by means of mineral breakdown.

Continued cropping on some experimental plots is demonstrating not only the exhaustion of the soil's mineral reserves. Where wheat, for example, has been grown annually for 55 years at the Missouri Agricultural Experiment Station, the gradual decline in crop yield for almost 40 years of that time is being followed during the last 15 years by an alternation of crop and non-crop years. This soil is taking a rest each alternate year, demonstrating the fact that not only the clay is exhausted of its nutrient store after a wheat crop in July but that the mineral reserve has been weathered out so nearly completely that the clay is not nearly sufficiently restocked in October to permit the crop then seeded to go through the winter. Oats as a spring crop, following a winter rest period, are more successful on soil after a preceding summer legume crop of lespedeza than is wheat seeded in October following right behind it. Fallowing at any time is an induced rest period and is an effective agent for a better crop because a better nutrient supply becomes quickly available on the clay and because the water is stored by it.

Intensive cultivation with its depletion of the nutrient stores in our soils is decreasing the grazing season of grasses, is matur-

ing reduced yields of grain crops earlier, and is reducing the yields of seed crops. As we seek to grow more crops by continued cropping and intensive cultivation, the soil takes more rest except as we replenish its nutrient elements by the application of fertilizer. Without such applications the resting clay of the soil restocks itself too slowly.

Our urgent need for increased food production is bringing us to realize that our soils take a rest because we are not giving them sufficient help to save them from exhausting their stock of nutrients required for continuous plant growth.

Barn-Curing Baled Hay

Engineers at Purdue University are finding out new things "every day" about mow curing of hay. Their most recent test has been drying freshly cut and stored baled hay. They built a 9′x20′ bin over a slatted floor and filled it tight with 6½ tons of alfalfa hay (uncured weight). The moisture content ranged from 30% to 35%. Air was blown through the baled hay for 14½ days, at which time the average moisture was about 12%. The bales were nearly as firm after drying as when freshly baled.

Whether this method has possibilities for curing hay remains to be seen, but the Purdue folks have proved that it can be done.

Chemists at the University working on the hay-storing problem have found that nutritionally-essential carotin in mow-cured hay is from two to two-and-one-half times greater than field-cured hay that has not been rained on.

—*Farm Journal*

A Simplified Breeding Program

Condensed from Poultry Tribune

G. T. Klein

Massachusetts State College

HIGH EGG producing ability is made up of five characters, all definitely inherited. But the most important of these is persistency. In everyday language, persistency is the ability to lay late in the summer or into the fall.

That is the conclusion of Dr. F. A. Hays, poultry geneticist, Massachusetts State College, from records on Rhode Island Red hens in the college experimental flock from 1938 to 1942.

If a hen has a laying year of 280 days or more after her first egg, she is said to have high persistency. Hens lacking this character laid 55.2 eggs less than those possessing it.

Just by way of review, the present theory of inheritance of high egg production was propounded by Dr. H. D. Goodale in 1918, then poultry geneticist at the Massachusetts Station. He named five characters all definitely inherited, which, when combined in a bird, would give a high producer. The standards for these characters have been changed from time to time, and here is the way Dr. Hays now interprets them:

1. *Early sexual maturity, 215 days or younger.*
2. *High winter intensity, clutch size of 3 or more.*
3. *Non-pause, winter pause shorter than 8 days.*
4. ***Non-broody for pullet year.***
5. *High persistency, a laying year of 280 days or more.*

It is reasonable to suppose that these standards might vary slightly with strains or with environmental conditions, but they would not be greatly different.

Prior to 1918, selection was made for total number of eggs and not for inheritance of individual characters. A few scientists were investigating inheritance of

Relation to Number of Desirable Characters to Annual Production

Number of Desirable Characters	Number of Birds	Percent of Birds	Average Egg Production
0	....	.....	.....
1	10	.82	124.90
2	69	5.66	157.39
3	393	32.21	187.96
4	439	35.98	223.89
5	309	25.33	251.60

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The value of the five characters is brought out in a different way in this most important table.

Number of Birds	Classification	Annual Production	Difference
309	All five characters	251.6	Control
19	Lack early maturity	244.7	6.9
182	Lack intensity	220.2	31.4
195	Lack non-pause	227.4	24.2
20	Lack non-broodiness	234.8	16.8
23	Lack persistency	196.4	55.2

high egg production in those days, but the experiments reported showed no improvement generation after generation when total eggs were the only consideration in selecting the breeders.

When Dr. Hays analyzed the records of the 1,220 Rhode Island Reds, he obtained the results shown in the table.

This table shows persistency to be of far greater importance than the other four characters, and from the small number of birds that lack it, it is to be concluded that it is one of the characters more easily attained in breeding, along with non-broodiness and early maturity.

Second in importance in the breeding program is intensity and the figures show that this character, along with non-pause, is more difficult to establish in a strain.

In order of their importance, the five characters are rated: high persistency, high intensity, no winter pause, non-broodiness, and early sexual maturity.

One might logically ask why the Massachusetts flock, after a quarter century of breeding for egg production, does not contain only birds that inherit only these desirable characters. There are a number of reasons. The inheritance of each of these characters is complex. They can't be measured in the males, and we did not have facilities to work with large numbers of birds, which is most important in a breeding program.

The pedigree breeders are making remarkable progress in establishing these characters in their flocks. Trapnesting and pedigreeing is out of the question for hundreds who would like to do some breeding on a less intensive scale, however. These poultrymen would like to go to a breeder each year and buy a few good chicks from which they could select a few cockerels to head a special breeding pen. From this pen, cockerels for the flock would be obtained.

At a recent poultry breeders' school, E. B. Parmenter outlined a very practical program, in which he recommended the following steps for such a poultryman.

1. Test purchased males by crossing with the home strain until a strain is found that crosses well, giving the desired improve-

ment. When such a strain is found, stick to it unless it is certain that some other will do better.

2. Buy 25 medium grade pedigreed chicks or 200 hatching eggs yearly.

3. Make the selection of the breeding females from two pens of birds running together. These will be reduced to one pen by selection. The two pens should run together so that birds will be accustomed to all birds in the pen.

4. Discard the 10 percent of the pullets that come into laying first and the 10 percent that come into laying last. Until ready to save eggs, these birds can be identified with colored leg bands and left in the pens until the final separation is made just prior to the saving of hatching eggs.

5. Put trapnests in the house and trap for two to four weeks in February. This will give information on egg cycles or intensity. Desirable breeders will lay at least three eggs before a skip. It also gives egg size of the birds. The most desirable egg size is 24 to 25 ounces to the dozen the third month after starting to lay.

6. Eliminate the birds that take a neck molt if they were hatched February 15 or later and there have been no abnormal conditions such as disease outbreaks or extremely cold weather when practically all birds stop laying.

7. Eliminate birds that go broody.

8. In September, cull for persistency, keeping those birds that are still laying or have just stopped as indicated by customary culling methods.

9. Select all eggs for good hatching egg quality.

This will give a group of birds selected for everything that a pedigree breeder can select for except hatchability. They would be mated to males from the pedigree breeder.

Parmenter believes that February is the best time to hatch the cockerels for the home flock. At that time the best of the breeding hens will be laying.

When ordering the chicks or eggs from a breeder it is extremely important to specify special qualities wanted. Families can be selected which excel in these points.

The egg size recommendations are important for it is obvious that we do not want to breed from birds that require six months to come up to normal egg size. On the other hand, the pullet that starts to lay 23- to 24-ounce eggs will reach 27- to 28-ounce egg size and this is too large for good hatchability.

What Is a Ram?

Condensed from Sheep Breeder

P. V. Ewing, Jr.

FROM THE TIME I first started leaning over a pen at the shows, or looking at a buck in some bluegrass pasture, I have had the principle in mind that a stud ram should be low down, thick, deep and blocky, legs on the corners, straight on top and sides, with a good even fleece, and above all a stud head. I had this as a picture of a stud ram because somewhere down the line someone told me that those were the factors that govern a good ram. I often wondered why and I expect there are others who have had the same thought. For those who are just starting with sheep, I will try to explain more fully my idea of "what is a ram?"

To start with the ram as a unit, or whole, and picture him as a complete individual, point No. 1 is the frame— the skeletal structure on which the rest of the ram is built. A ram must have size or scale. This is an essential. Rarely do you get a great sire of any breed that is overly large or on the "horsey" side, so care must be taken in selecting a ram to get a balanced sheep. The other extreme or the "pony" kind of a ram is also to be avoided. Never use such a ram on a good group of ewes or the results will be most disappointing.

A well balanced ram constitutes an individual that is thick and deep with a thick, meaty, well developed quarter. The top of a ram should be straight and strong. Remember, the ram is a unit and the shoulders should be moulded and closely knit to the body, neither open nor loose on top or behind the blades. Faults with many rams are either high or low behind the shoulder. A high shoulder is not as serious as public opinion would have it if it is behind a neck which fits well into the body. Over against this, a weak back or dip behind the shoulders should be avoided at all costs and any ram pulling down here should be discarded.

The sides of a stud ram should be smooth and straight. Starting at the point where the foreleg is attached to the body and working back across the ribs to the point where the hind quarters are at-

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tached, the ram should carry through at approximately the same thickness. Where most rams fail here is in a good spring of rib.

A stud ram must have a sound set of legs. By sound I mean legs that contain sufficient bone to carry the animal well. The tendency is for lambs to revert to fine boned, narrow chested animals. Consequently, the bone in a ram should be heavier than that expected in lambs he sires. Legs should be straight, well muscled, set on the corners and short. Weak pasterns are to be avoided as are hocks that turn in and front legs that come together at the knees.

Any old sheep breeder will tell you that even with all of the above mentioned good qualities, without a good head, you are still without a ram. The head of a ram should be short and broad with a strong muzzle, denoting masculinity. The ears should be well apart in most breeds, but ears and wool covering on the head of various breeds is a matter of minor importance, yet is, unfortunately, one of considerable controversy. The eye should be bold and open, set so the ram can see all that goes on around him. The head, neck and shoulder of a ram should be moulded together as a unit. The neck should be masculine, short and well muscled.

The brisket of a ram should be full and carry out reasonably well in front of the foreleg. There should be width here between the two front legs as here is the space where the heart and lungs need room for development which denotes a vigorous constitution.

The wool on a stud ram is unfortunately considered secondary by most ram buyers, but this is a great mistake, especially in such breeds as the Corriedale, where the wool is a major factor. The wool must be elastic in fiber. A fleece that is harsh to the touch and non-elastic is to be discarded. The length of staple in a fleece is of more importance than density, after a certain point is reached. Fantastic claims for poundage of wool produced by given sires are of very little value in determining the value of his offspring, so far as fleece is concerned. Wool should grow at right angles to the skin of a ram. Once the quality and length of staple of the fleece is determined then character is next. Character is of utmost importance and is a vital factor in determining the value of the sire with regards to wool production.

The underline of the ram should be straight and deep, fairly close to the ground. Over the rump the top line should not drop off but carry out well, then drop off square over the tail head. The loin should be thick and fleshy.

In general, the ram should not be either too long bodied or too short coupled.

The question of condition of a ram at time of purchase is also important. Most authorities agree that no ram should ever become overly fat as this will temporarily or sometimes permanently injure his breeding ability. A ram should be sound and straight, carrying a reasonable amount of fleshing. Because a young ram possesses all of the good qualities I have mentioned to some degree doesn't necessarily make him a stud ram. His only claim to stud fame is his ability to transmit these sought-after qualities to his offspring.

The last point I would like to make and one I feel is most important is that just because a ram is sired by a certain stud, out of a certain ewe or from a certain breeder's flock, is no assurance that he is a top stud prospect. Regardless of the flock, there are culls and some rams that are so far superior to others as prospects that the individual sheep after all is paramount. Avoid rams that are smothered in fat and smothered in wool. It is just a good general practice.

New Drug from Tobacco

The human machine has a new medicinal agent to aid in its fight against wear and tear. It's rutin, a bright yellow non-toxic powder from the leaves of bright or flue-cured tobacco. Patients suffering from "increased capillary fragility" show marked improvement when administered rutin.

Rutin acts on walls of tiny blood vessels or capillaries which have become brittle and permit blood to break through, causing small hemorrhages. If this occurs in the eye or brain, blindness or even apoplexy may result. Rutin is combined with remedies for high blood pressure to obtain results in shorter time, according to U.S.D.A. scientists.

—*Southern Agriculturist*

Hubam Clover a Four-Way Crop

Condensed from Farm and Ranch

E. W. Lyle and H. O. Hill

Texas Agricultural Experiment Station No. 5, Temple, Texas

DIFFERENT kinds of clovers have been in agricultural development for many years, and the plowing under of legumes for manuring the soil was a practice advocated by the Chinese several centuries B.C.

Hubam clover is one of the legumes or nitrogen-fixing plants useful in soil building. It is an annual form or selection from the white flowering sweet clover.

Under conditions in the Blackland area of Central Texas, Hubam is a fast growing clover and attains a mature height of 5 or 6 feet in a few months' time. At that stage the stems are woody, however, and the leaves and seed tend to shatter from the plants. Earlier stages are succulent and may be cut for hay. The plants grow erect instead of spreading out as some clovers do.

An interesting fact that may have much to do with the soil-improving characteristics of Hubam is that the root system is so extensive and large that it may represent 30 per cent or more of the total growth.

Hubam may be grown for hay or for seed as well as for soil-building purposes. When cut young before the flowering stage is reached, the stems are succulent and may be satifactorily mowed and made into hay the same as many other clovers. A practice used in some of the experiments at the Blackland Experiment Station is to cut a hay crop and then allow the second growth to develop for green manure. A disadvantage in such a practice, however, is the effect that a dry season will have. In case the weather remains dry after the hay crop is removed, there will be very little second growth, and the organic matter added to the soil is composed mainly of roots. As pointed out previously, the roots constitute about a third of the total plant growth. Therefore the crop, even in dry seasons, is still advantageous from the standpoint of the organic material added to the soil.

Another, and possibly the most important, use of rotations with Hubam clover is the reduction of losses due to root rot. This disease has been known to cause

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serious damage to cotton and many other crops for over 50 years. The plants wilt suddenly and die, and the disease spreads from small spots to finally larger areas as the season progresses. Each year the losses due to root rot of cotton in the Blackland areas of the southwest have been estimated at millions of dollars.

Until now there has been no satisfactory control for the root rot disease under field conditions except perhaps a long time rotation in corn, grains and other crops resistant to the disease. Although further study and substantiation is required, certain tests have shown definite reduction in root rot of cotton following Hubam clover. Peculiarly, the Hubam clover, itself, is not resistant to root rot infection, but normally completes its growth before the disease causes much damage. Its effect in controlling root rot is on the crop which follows it. Whether it is simply the organic matter added to the soil by Hubam or some other reason for its control of the disease, is not known at the present. A decrease in root rot kill of cotton, particularly that occurring early in the season, is directly related with improved yields. In one experiment conducted for three years at Temple, root rot was reduced two-thirds and the yield of cotton was doubled where cotton was grown in the two-year rotation with Hubam. Slightly better results were obtained where cotton followed Hubam which was allowed to mature for seed than where part of the growth was removed as a hay crop.

In the same experiment, Hubam clover also caused an increase in yields of corn when grown in the two-year rotation, Hubam-corn, but the results are not as striking since root rot does not affect corn. A summary of the three-year study is given in the table.

A further indication that Hubam is important in reducing losses from root rot was evidenced in a one-year rotation last year. Hubam was planted October 8 as a winter cover crop and was plowed under March 15 preceding the planting of cotton on April 14. Notwithstanding that the growth of Hubam due to late planting was small at the time of plowing under (averaged only 3 inches high), the root rot kill of cotton on August 2 was only half that of the check plots where cotton was grown without rotation. The final yield of lint cotton was 218 pounds per acre for the rotation and only 153 pounds for the check, an increase of 42 per cent where Hubam winter cover crop was used.

Besides the uses of Hubam for soil building, for root rot control, and for a hay crop, it is also of advantage as a seed crop. A nor-

mal yield of from 200 to 500 pounds of seed per acre gives a return comparable with most crops suitable for this area. When in flower, the crop has been used to some extent by beekeepers for honey.

A discussion of methods in the growing of Hubam depends on climatic conditions and also the primary purpose for which the crop is grown. Normally, the seed is broadcast or drilled at the rate of 12 to 15 pounds of seed per acre. Where the winters are not too severe, fall planting is preferred. If the clover is planted early enough to reach a height of 3 inches or more, it will tolerate considerable freezing. At that stage it has withstood temperatures under 15° F. at the Temple Station. However, if the plants are just emerging from the ground in the seedling stage, even a slight freeze is apt to cause considerable damage. For fall planting, Hubam should be seeded by the first of October in the southern blacklands. It can be used for a winter cover and plowed under in the spring, allowing two weeks or more to elapse before cotton planting, or it may be left for hay or seed. Where winter weather prohibits growth, Hubam may be sown in the spring and then either a hay or seed crop obtained.

It may be sown on land which has been flat broken or it may be drilled or disked in without plowing where it follows a clean cultivated crop such as cotton. The old cotton stalks can be cut either before or after seeding.

As would be expected with any other crop, there are certain limitations affecting the production of Hubam. At present the seed cost is high. Nevertheless with only 12 to 15 pounds of seed per acre the cost now should not exceed $3 per acre. The liability of freeze damage to young plants has already been mentioned. The quality of hay is another factor. The coumarin content in the hay causes a bitter taste, and livestock have to become used to it before they will eat the hay readily. The stems become woody with age, and for hay the cutting should be made early while the stems are tender. Stemminess in the hay can be overcome if necessary by grinding and analyses have shown sweet clover hay to equal alfalfa on the basis of digestible proteins and nutrients. Like all hays, Hubam must be cured properly. Some cases of bleeding diseases in cattle have been attributed to the feeding of spoiled clover hay.

Due to the rank growth which Hubam makes, it is somewhat difficult to harvest seed with a combine. One method to overcome this is to top the plants with a mower when they are not over a foot or two high. The sub-

sequent growth is shorter and more easily combined. Another method to avoid clogging a combine is to cut a narrow swath and not try to use the entire width of the cutter. Due to the fact that seed does not ripen uniformly, it should be spread out to dry after harvesting before sacking for storage. The heavy growth also makes turning under rather difficult; however, a disk plow will usually do the work satisfactorily. Last but not least is the objection that while Hubam may accomplish reduction in root rot to succeeding crops, it is susceptible to the disease itself, and a small percentage may be lost before the crop is mature for seed. In comparison with other plants, Hubam is the best legume for its purpose that we have tested at the Blackland Station to date.

Cotton and Corn in Two-Year Rotations with Hubam
(Austin Clay Soil) 1941-1943

	Average for Each Year		
	Lint Cotton Pounds per acre	Bushels Corn per acre	Cotton killed by root rot
Cotton preceded by Hubam for seed	343		3.5%
Cotton preceded by Hubam for hay	291		9.7%
Cotton-corn rotation	226		27.2%
Cotton continuous (check)	166		39.8%
Corn preceded by Hubam for seed		38.8	
Corn preceded by Hubam for hay		37.0	
Corn-cotton rotation		34.9	
Corn continuous (check)		29.6	

Columbus Took a Chance

Condensed from The Horse

Alden McKim Crane

THE ability to take a weedy, undernourished young horse and by a judicious feeding and exercising program to develop him in time into a well proportioned animal capable of doing the work required of him without undue fatigue, or breaking down, is one of the marks of the finished horsemaster.

Some people who have been in contact with horses all their lives seem to come by this ability naturally, but any rider with an understanding of horses, a working knowledge of modern stable management, or even just plain "hoss sense" and the desire to learn can acquire it.

Buying a young horse in poor condition when he will command a fraction of the price demanded for horses of the same age and breeding, but with more flesh on them, and developing him, is at times highly profitable. And, in addition, watching a horse one has worked over and cared for slowly change from a slab sided, staring coated colt to a beautiful animal with well developed muscles rippling under his skin gives one the feeling of having created something.

If you are inexperienced in such matters, but have located a young horse which you feel with time and care might turn out to be the kind of animal you want, examine him systematically before closing the deal, no matter how attractive the price. It costs just as much to keep a poor horse as a good one. And remember that any horse deal, even one involving a finished animal, is a gamble and the odds are a lot greater against you when you cannot see what you are getting, as is usually the case when buying a horse in poor flesh.

Your first serious examination of the animal, after you have assured yourself that his age and breeding are as represented, will be to determine if his conformation, or to be more exact, his future conformation will be what you have in mind.

Have the horse brought out into the open and stand facing his side, but about thirty feet away. Look him over carefully, disregarding his unkempt coat, matted mane and unshorn fetlocks, but paying particular attention to the symmetry, or lack of it, of his proportions. Then

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close your eyes and try to visualize what he would be like if his neck, quarters and back were filled out and he was cleaned up. Do this several times, but each time looking at the horse from a different angle. If you think he will look all right once he gains some flesh, carefully examine his conformation.

Some people can judge conformation at a glance; others cannot. The writer has always found that by taking a sheet of paper and writing the names of the principal points of a horse in a column and grading each point on the basis of ten being perfect and then adding the figures and dividing the sum by the number of points, a very clear idea of what the horse really has can be gained.

If you do not really know what to look for when judging a horse for conformation, take a friend with you who does. Or, failing that, consult a good book on the subject. But bear in mind that a horse with a nice looking head and neck, deep through the chest, a long sloping shoulder, a short back, straight legs, hocks close to the ground and good feet with sloping pasterns should turn out all right, provided he has no blemishes which might later cause unsoundness. Occasionally a thin horse will have, or appear to have, a ewe neck. This is usually due to lack of flesh and general debility and will often disappear if the animal is fed from ground level and fattens up.

If you are satisfied that the horse's conformation is satisfactory, and it really takes an experienced person to judge the future conformation of a young horse even when he is in good flesh, have him trotted to and away from you on level ground and note carefully whether his legs move in straight lines, or his feet have a tendency to swing in or out. If this latter condition is at all pronounced, it is better not to buy, as such horses frequently later give trouble when they are shod from brushing, that is, bruising or cutting a fetlock or pastern. However, before discarding a young horse for this cause, make sure that the trouble is not due to youthful awkwardness or weakness.

If you are convinced after your examination that the horse has possibilities and intend to buy him, have a good Veterinarian go over him to make sure that he has no organic or contagious disease, nor any serious blemish which you might have missed.

As soon as you get your new purchase home, you can commence his conditioning program and with it his training. Reduced to their fundamentals, training and conditioning horses are mostly a matter of plain common sense, plus a modicum of "know how."

Or perhaps some advice an old colored stable sergeant once gave the writer would more aptly describe what it takes. "Ef you want to mek a good hoss," he said, "you jest got to tek yo' time and have mo' sense dan de hoss."

Nearly any young horse, or old one too for that matter, coming out of pasture will have some type of internal parasite. There are plenty of good remedies on the market capable of being administered by owners or grooms which will eliminate these barriers to good health. *But it is far better to have it done by a competent veterinarian.*

As soon as the horse has been wormed, you will get some results from the feed you put into him. Now getting a horse fat, and fat later turns into muscle, is not merely a matter of feeding plenty of hay and oats, but done properly is the result of judicious feeding, lots of grooming and proper exercise.

A horse in proportion to his size has a very small stomach and even when in good health cannot assimilate large quantities of concentrated food. So one of the primary rules of feeding grain is: Feed little, but often.

A thin horse's stomach is even smaller than that of a normal horse, so before you can commence feeding him a relatively large quantity of grain, you will have to enlarge the capacity of that organ, or as horsemen say, "make him drop his belly."

This is done by feeding him all of the good quality hay he will eat. After his stomach has dropped, and it will be apparent to the eye, the hay ration can be reduced to keep him from getting a hay belly and the grain ration increased to produce muscle.

In order to keep it from being wasted and for the horse to get the greatest benefit from it, hay should be chopped and fed from a wash tub. The writer kept his jumping string in Europe in excellent condition by feeding a mixture of beans, crushed oats, bran and chopped hay and gave no long hay at all. In addition to this the horses got green food and once a week a hot feed.

The hay ration should be supplemented by the addition of fresh cut green food, or carrots, and if possible grazing. Grazing is extremely beneficial to any horse, but even more valuable to one that is thin. If possible to do so, let your horse spend as much time as his feeding and exercising program will permit in a paddock. The grass, fresh air, sunshine and light exercise will do him good.

The writer has found that hunters and jumpers keep in better condition and are less susceptible to bad leg conditions and colds, if they are not kept in the

stable during the day, but are turned into a paddock after their morning exercise. They can be brought back to the stable for their midday feed and then after it has had time to digest, taken back to the paddock and left there until time for evening stables. Not only does this system improve horses' health, but it also decreases materially the expense of bedding.

No hard and fast rule can be laid down as to how much oats a young horse can be fed, as horses differ, but the average three year old, emaciated and just out of pasture and unaccustomed to grain, should start off with about six pounds of crushed oats a day which can gradually be increased until he is getting twelve pounds. However, the six pounds should be given in feedings of not more than a pound and a half each with a double hand full of bran added. Crushed oats should be fed as they are more easily digested by a horse in a weakened condition.

After he has had a feed of oats, a horse should be given nothing else for at least an hour. A horse's digestive apparatus works continuously and if hay is given after oats, the hay will force them out of the stomach and into the large intestine before they are thoroughly digested. For the same reason, it is better, unless a horse is an extremely moderate drinker, not to have water before him at all times as many horsemen advocate. It is true that a horse with constant access of water is not apt to drink enough to harm him, no matter how much grain he has in his stomach, but the water will wash the oats out of his stomach before they are digested and will be wasted. The longer oats remain in the stomach, the more thoroughly are they digested and the more benefit is gained from them.

Vary the oat feeds with hot mashes made of oats, bran and linseed. And always have a lump of salt where the horse can reach it.

Linseed, due to its high fat content, is an excellent conditioning food, but not more than a pound a day should be given. It can be crushed and mixed with dry feed, or included in mashes. But the simplest method of using it, is to let it soak in water until the grains are soft, which will cause a jelly to form, and then pour the mixture on dry crushed oats. Although it is frequently done, linseed should never be fed whole and dry, but crushed, boiled, or soaked, as its extremely tough husk makes it hard to digest.

One of the best conditioners is grooming. And by grooming, we do not mean only getting a horse clean, but in addition to that giving him a brisk massage. This

stimulates the flow of blood and tones up the system. In conditioning horses and keeping them in good condition, grooming cannot be too highly emphasized. Every horse should have at least one half hour of it a day, and one that needs building up should have an hour, or if possible even more.

During the Battle of Flanders in 1940, the writer came in contact with a battery of German field artillery and saw a very good example of the value of grooming and all around good horsemastership. That outfit had been making forced marches for several days and all of the horses, with the exception of two pulling a heavy wagon, were in a terrible, thin, and exhausted condition. But those two were fat, hard and sassy with well covered ribs and coats which shone like satin. Being anxious to learn why those two horses, which had been doing the same work as the others, were in better shape, I watched their driver carefully.

In addition to seeing that his animals got their full rations of hay and oats, he went around after the men had finished eating and picked up any scraps of bread they had thrown away and adding them to his own bread ration, gave them to his horses. Then while the other men were lying around resting, or playing cards, that man was busy grooming his animals. And from what I could see, in addition to the requested grooming at morning stables, he gave them each at least forty-five minutes a day during his own free time. Then whenever he got a chance, he let his team graze. I saw him doing this one night after ten o'clock.

In order to build a horse up and develop his muscles, in addition to feeding and grooming, he must have the proper amount of exercise. At first, in the case of a thin horse just out of pasture, this should take the form of long quiet walks, broken after the first week or two with a short period at the trot to work up a sweat.

Sweating is important, as in addition to improving the coat, body wastes and poisons are carried off with it.

A young horse in poor condition, even though quiet and accustomed to the saddle, should be led instead of ridden at exercise until his back and leg muscles develop enough to bear the strain of a rider's weight.

The amount of light exercise to give depends upon the condition of the horse, but the average three year old in poor flesh can start off with an hour's slow walking a day. This can gradually be increased to three hours.

One of the best ways to bring out shoulder, back and haunch muscles is to give horses a lot of slow work up and down hill.

As long as a horse enjoys his feed and shows no signs of stiffness, or heat in his legs, he is not getting too much exercise. If he goes off his feed, have his teeth examined, as new teeth frequently cause sore mouths and at times old ones wear down, forming rough edges which make eating painful. These conditions can sometimes be learned without examining the horse's teeth because he will slobber and toss his oats about when eating. If his teeth need treating call a Vet, but if his teeth are all right, it is best to cut down on his exercise until he takes more interest in his food.

There is an old saying, "No hock, no hunter. No foot, no horse," which is just as true today as it ever was.

Too much attention cannot be given a horse's feet. They should be picked out twice daily to keep them clean and, in addition, if the horse is unshod, they should be trimmed at regular intervals by a good blacksmith.

When having a horse shod make sure that the blacksmith does not cut any more from the hoof than is absolutely necessary to make the shoe lie level. Do not allow him to pare the sole, cut the bars or frog, nor rasp the outside of the hoof. Three nails on each side are plenty to hold a shoe on a horse doing light work, and with the possible exception of heavy draft horses, toe clips do more harm than good. If you insist upon these things, a good blacksmith will respect you for your knowledge, and a poor one, who is not worth fooling with even in these times of scarcity, will probably tell you that he knows his job better than you do.

To get the best out of a horse, in addition to caring for his bodily needs, it is also necessary to gain his confidence. This is not hard to do. Talking to him, petting and handling him and giving him tid-bits is all that is necessary, and it really pays off when serious training commences, because half of the battle is won. A horse with confidence in his rider will do almost anything asked of him.

Pigeon Heroes

Condensed from The Christian Science Monitor

Lorine Letcher Butler

IT is at Camp Edison, in New Jersey, and Camp Crowder, in Missouri, that most of the rearing and training of pigeons for United States military service are conducted.

Every ship of the RAF that flies from England carries its contingent of pigeons, for if a ship is forced down at sea or in some inaccessible spot, or behind the enemy lines, and its radio is disabled or silenced necessarily, then the call for help is carried by the pigeons. In the last three months of the war more than 65 pilots have been saved by their pigeon messengers.

World War I had its pigeon heroes that shared with Sergeants York and Woodfill in public plaudits. Cher Ami, "a black check hen," and most famous of all pigeon heroes, carried the message that saved the "Lost Battalion" in the Argonne. With one leg shot away, Cher Ami fought her way through heavy artillery fire to bring word to the Americans of the plight of Major Whittlesey and his command. Cher Ami now stands in mounted glory in the National Museum at Washington.

And this war is fast producing pigeon heroes worthy of the Cher Ami tradition. In North Africa "Lady Astor" flew 90 miles to deliver her message despite serious wounds. On Guadalcanal "Blackie Halligan" was launched into the air with an important message. Almost immediately the bird was brought to earth by the fire of enemy guns. But five hours later Blackie, maimed, arrived at his loft.

On Aug. 19, 1942, the first news of the Allied landing at Dieppe was carried across the Channel by pigeons, traveling 27 miles in 32 minutes. It was the pigeon, "Yank," who brought word of the capture of Gafsa in the North African campaign. And on May 9, 1943, we read a report in a New York newspaper from Tunis, "via carrier pigeon to Allied Headquarters," of the triumphal entry of the United Nations into that city, "the greatest prize of the Tunisian campaign." The official title, however, of the messenger pigeon is homing

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pigeon, as carrier pigeon relates to another breed.

The pigeon hero may have only a number to distinguish it, as among the thousands of pigeons in military service names are bestowed only as occasion demands. But all Army pigeons are numbered and wear their number on a tiny leg band. It was U. S. Army pigeon 1169 that received an Army citation for "meritorious conduct," when the Coast Guard schooner with which it sailed developed trouble at sea, and No. 1169 flew ashore with a message giving the location of the ship and the reason for its plight.

It was a little homesick pigeon, "Miss 1303," who established the world's record for long-distance flight. Miss 1303 had been purchased in Venezuela by an American engineer and brought to his racing loft at Elmont, Long Island. But the pretty foreigner did not like America. Perhaps it was the climate. Or, the language. She longed for her native mountains and rivers. She ran away. And in 15 months Miss 1303 arrived at her Venezuela home, after flying 3,000 miles across mountains, rivers, and forests, and dodging hawks and other bird enemies.

Racing pigeons bear the number by which they are registered with the racing association that they represent. In the United States there are two of these organizations, the American Racing Pigeon Union and the International Federation of American Homing Pigeon Fanciers. When the Japanese attacked Pearl Harbor the War Department called upon the members of these associations and all civilian breeders of homing pigeons to surrender their birds to Government needs, as at the beginning of the war there was only one active Pigeon Company and certain specialized detachments in the United States Army.

The response was immediate and generous. Birds arrived by hundreds and thousands. There were 500 in one shipment alone. Many were champions. All had worthy records. And these were the birds that were to fly through shot and shell over the battlefields of Europe, Africa, and the islands of the South Pacific, and to make history.

These highly bred birds, too, were the nucleus of the supply stock at Camp Crowder and Camp Edison. The officer in charge of the Pigeon Replacement Company must be a trained ornithologist. Maj. Joseph F. Spear, Commanding Officer at Camp Edison, was an eminent Kentucky ornithologist before joining the Army. One of his assistants, Second Lieut. Walter F. Van Dien, was a member of the Michigan Department of Conservation in the days before the

war. Even the pigeoneers, the men who attend the pigeons, must have had several years' experience in handling pigeons before taking over the Army's job.

At Camp Edison the roomy, battle-gray pigeon lofts stand row after row, in army camp style. Neatly graveled walks pass along the outside, and inside there is military orderliness. Immaculately clean, with floors freshly sanded each day, the pigeons' quarters seem to be all that a pigeon might like. The pigeon hospital has few patients.

Military training begins for a pigeon at the age of 28 days. It consists chiefly of carefully timed flights, gradually extending over longer distances and varying conditions. The pigeon returning through the little trap door of its loft, which smartly permits ingress and prevents egress, is immediately fed. It is through food and its family affections that the homing instincts are developed in the pigeon. The family life of the pigeon is exemplary. It is a loving parent and a devoted mate.

At Camp Edison pigeons are trained for use in all branches of military service, and there is special equipment for each assignment. The Portable Combat Loft is home to pigeons, whether it is on a rolling battleship or camouflaged in a South Pacific jungle. The Mobile Combat Loft is carried on a trailer behind the ever-useful jeep and keeps step with the infantry on its global march.

For the Air Forces there is the Permanent, or Stationary, Loft, as it has been found advisable to provide the feathered fliers, like their human colleagues, with a permanent base, because of the rigorous condition of flying with men. Descending in its own parachute upon occasion, or lowered in a cage from 20,000 feet to its own ceiling of 10,000, and launched from a speeding ship wrapped in a slit paper bag to protect it from the terrific force of the slipstream—these are some of the tasks that fall to a pigeon flying with the Air Forces.

And with the pigeons, around the world go the pigeoneers, the men who care for them, train them, pet them. Except for the pigeoneer, such performances as those of Lady Astor and Blackie Halligan, or Yank, would not be possible. But like the men on the production line he works in the background—unknown.

We are the Army Pigeoneers;
Our ranks are small and few the cheers—

so go the opening lines of Lieutenant Schmidt's song.

The ABC's of Sanitation

Condensed from American Hampshire Herdsman

Charles R. Henderson
Ohio University

DO your pigs average 225 pounds at 6 months? If not, you should check up on your methods to see what is preventing them from doing as well as the herds of many commercial pork producers which consistently make this age-weight goal.

Perhaps you tell yourself and your neighbors, "I didn't crowd my pigs much this year. I could have made them bigger if I had pushed the feed to them." Or you may give the stock explanation, "This spring was a bad one for pigs." Any spring is a bad one for pigs if sanitation is only half practiced; so a thorough check-up of your sanitation practices is very much in order—the wartime emergency demands maximum efficiency.

What difference does it make whether it takes 6 months or 9 to get a pig to 225 pounds, or as has often been said, "What is time to a hog?" It makes a big difference in the profits of the pork producer and in his contribution to the war effort.

Experiment stations have shown time and time again that the fastest gaining pig is the most economical in the use of his feed. It takes so much feed each day to keep any pig alive (nutritionists call this amount "maintenance requirement"). Any additional feed goes for growth and fat. The more days that a pig takes to reach the 225 pound mark, the more days he is eating feed which accomplishes nothing but keeping him alive.

Thus by speeding gains, the hogman can save feed, a vital war material just the same as rubber and metals. Most observant hogmen have often noticed that the fast gaining pigs are almost invariably the smooth, meaty, deep-bodied, type pigs which bring top prices. Slow gains can easily undo years of painstaking breeding for desirable type.

What then are the most probable causes of slow, profit-stealing gains? Ninety-nine times out of 100 it is one of three causes or a combination of the three: (1) poor breeding, (2) poor feeding, (3) absence of ordinary common sense sanitation. Of these, the third is by far the most seri-

ous bottleneck in pure-bred herds.

An increasing number of herds are being bred for the ability to gain rapidly, and those swine breeders who fail to utilize the tool of production testing as sponsored by their breed associations are going to find growing difficulty in selling their untested product.

The second cause of poor gains, poor feeding, is also a relatively unimportant factor in most pure-bred herds, as most purebred breeders are good feeders and fully recognize its importance. In fact, many probably work just a little harder at feeding than is practical. A very simple ration of corn or corn and oats, plus a mixed protein supplement such as tankage and soybean meal with good pasture in season; and ground alfalfa or alfalfa meal when pasture is not available will, when fed free choice, do just as good or better a job than many fancy rations mixed up into "labor-consuming" slops.

When it comes to the third factor causing slow gains, poor sanitation, all too many breeders slip up in their production methods. For example, time and time again successive droves of pigs can be seen running in the same lot or pasture year after year. If a single one of these pigs reaches 225 pounds at 6 months, it is a surprise, and if the average is that good, it is little short of miraculous.

Hogs live close to the ground and in close contact with one another. They, like chickens, are therefore very susceptible to filth-borne diseases and parasites. Worms and necro are the most common parasite and disease, respectively, resulting from poor sanitation. Often the two go together.

Symptoms of filth-borne pig troubles are runtiness, rough hair, tucked-in middle, scouring, coughing and thumps, and poor appetite. Death loss, perhaps unfortunately, is unusually low. The affected pigs seldom will pay for their feed and might as well be knocked in the head. Any breeder worthy of the name will, if he experiences such difficulties to any great extent, do something drastic to clear up the condition. It is, however, the mild cases of internal parasites and disease resulting from poor sanitation and which usually go more or less unnoticed that cause the real loss.

There are all degrees of infestation from only a slight slowing of gains to the extremely emaciated, heavily infested case. Some of these milder outbreaks result in maybe 1 pig in 10 becoming a runt, resulting in a 20 to 50 pound lower herd average at 6 months than that of the best hogmen.

The first thing any hogman—

one who sincerely wants to improve his methods—should do is to cast a really critical eye on his herd, the same as he would do on the other fellow's. If he finds that there are too many unthrifty, slow gaining pigs in the bunch and too few fast gaining, smooth, type ones, he should check up on his sanitation program.

On paper, swine sanitation is simple. It consists of only three essentials: (1) Clean out the farrowing house thoroughly, using boiling lye water. (2) Wash the sow carefully before putting her in the farrowing house. (3) Never let the suckling sow or her pigs set foot on a lot or pasture that has had pigs on it during the last 12 months. Preferably it should have been cultivated during the intervening year.

Putting these three essentials into practice requires a lot of ingenuity, planning, foresight and determination. Although no figures are available to prove the statement, it is doubtful if 1 breeder in 100 could claim that he has religiously followed all these practices. The suggestions given below do not by any means cover the possible schemes for doing so, but they have proved helpful to some swine growers.

The farrowing house and any other house in which the pig may later be put should be cleaned out as thoroughly as possible with a shovel or broom and then scrubbed out with boiling lye water. Mix the lye and water in the proportions suggested on the label. The lye helps loosen dirt, which may hold millions of worm eggs. Spraying with any good disinfectant after cleaning is also advisable. Before the sow is put in the farrowing house her legs, side and udder should be carefully washed. Caked mud on the teats can give the pig a good shot of worm eggs with his first meal.

The acid test of a man's methods comes with his efforts to keep the pigs off of ground recently run over by pigs. No half-way measures or compromise must be tolerated. There is only one way to raise pigs and that is on clean ground. There is no simple answer to the problem, but every hogman must find the answer if he wants to be successful over a period of years. He may get by for a few years using the same lots and pastures over and over again, but his sins will eventually catch up with him.

Just how can you lick this clean ground problem? The smaller the herd, of course, the more simple the problem; and the larger the herd, the tougher. The simplest solution is one which is not practical for most purebred breeders, but it is used by some successful commercial producers. This method involves the farrowing of only one litter per sow each year and farrowing

them late right out on good pasture which has had no hogs on it for at least a year. Pigs farrowed in May or June require little in the way of housing or care and are almost invariably thrifty and healthy. This system has the disadvantage of getting only one litter a year out of the sow and bringing the pigs to market at a time when prices are usually low.

Litters farrowed in late winter and early spring present a serious problem, since no pasture is ready in the Cornbelt at that time. What then can the hogman do to keep them off infested ground? Here are some possibilities: (1) Build a concrete exercise floor adjoining the central farrowing house or portable farrowing houses. (2) Run the litters in rotated bluegrass lots. (3) Turn the pigs on alfalfa or other meadow which is to be plowed up for corn. (4) Farrow the pigs out on fall seeded rye if they do not farrow until around April 1 to 15, the time when this crop is ready to pasture in the central states.

For the man who has a fairly good sized herd and a central farrowing house the concrete exercise floor offers one of the best solutions. A floored pen about 8 by 10 feet for each sow and litter is adequate and can be built for around $8 to $10 or even less if you do your own work. This is a very small investment when spread over several years. Such a floor is easy to keep clean and sanitary. Some pork producers are, in fact, raising their pigs to market weight entirely on concrete. On most farms, however, once pasture is available, the pigs can be better and more cheaply raised out on the pasture.

Just two things should be mentioned about starting pigs on concrete: (1) Either provide sod strips or supply iron to the pigs by painting the sow's udder with iron sulphate to prevent anemia (thumps) and (2) Be sure to include plenty of alfalfa in the sow's ration and in that of the pigs if they start eating before they can be moved to pasture. Alfalfa goes a long way toward providing the same things as pasture.

By careful planning it is possible on many farms to provide clean ground at once for even the early farrowed pigs. As was mentioned above, bluegrass pasture may be used for that purpose particularly with smaller herds and with small movable farrowing houses. Although bluegrass provides little or no pasture in March and early April, if there is a good sod it will be infinitely cleaner than a bare, muddy lot. If you are going to use bluegrass for this purpose, provide at least three fields—use a field one spring, then keep all hogs off it for the next two years.

Since the sod is not plowed and cultivated, death of worm eggs and disease organisms is rather slow.

Alfalfa which is to be plowed can be similarly used provided no hogs were on it the previous year and better yet during the past two years. Alfalfa which is to be held over for hay or pasture should not be pastured so early as it is very hard on the stand. If at all possible, each sow and litter or at least two or three litters should be penned separately. It should be made absolutely certain that the pens or fences will hold the little pigs or they are sure to get out and root around in some infested soil, thereby nullifying all your good intentions.

If, as many hogmen now do, you wish to have the pigs farrow close to the barns and near a source of current so an electric brooder can be used for a few days, the pigs can be confined in the farrowing house until they have gained strength, and then moved to clean bluegrass or alfalfa.

The pigs should, of course, be hauled to pasture, rather than driven over infested ground.

If the pigs are kept off infested soil for the first few weeks of their lives, the war for health is pretty well won. How can the final battle be won? Simply by making certain that plenty of clean pasture is available, remembering that "clean" means that no hogs have been on it for at least a year. At the same time that the pigs are kept free from disease and parasites, good pasture will reduce somewhat the amount of corn and quite markedly the amount of protein needed for a hundred pounds of gain.

What kind of pasture is best? Alfalfa is in a class all by itself everything considered. One acre provides pasture for 15 to 20 pigs from about May 1 to the middle of September and a load or two of hay besides. Sufficient acreage should, in fact, be furnished so that some hay can be cut. Otherwise the stand is likely to be damaged. Alfalfa is a somewhat tricky crop to get established, but if you select a well drained soil, apply lime and fertilizer liberally, prepare a smooth, firm seedbed, reduce the rate of seeding of the nurse crop, and seed at the proper time, failures can be reduced to the minimum.

Rape is another good pasture crop, but seed is difficult to obtain since we have always imported it. Rape is seeded about oats-seeding time, makes pasture in about five weeks and is good until frost kills it.

No other all-season pasture crop will do as well as alfalfa or rape in the Cornbelt although red clover, alsike or other legumes as well as sudan grass provide fairly good pasture.

Unfortunately, when you rotate your pasture as must be done to provide clean ground, the pasture field will in some years probably be located rather far from the house and may be lacking in natural shade and water. These handicaps are bothersome but not serious enough to warrant using a more convenient but infected pasture. Electric fences will help solve the fencing problem. Self feeders cut the labor of feeding to a minimum. For those few who do not believe in self-feeding a weather-tight feed storage bin of reasonable capacity will help considerably. Some men make use of portable chick brooder houses for pasture feed storage.

If water is not available in the pasture barrel, waterers on skids are a simple solution for the small herd. For the larger herds, large tanks which fit on the running gears of a wagon or trailer can be obtained at a relatively low cost. Three or four hundred gallons can be hauled at one trip. Once in the field the water may be siphoned into large waterers, or automatic waterers may be attached directly to the water tank which is left in the field until empty.

Shade can be conveniently provided by setting posts and covering them with brush or straw. If the ground under the shade becomes dusty, crude oil will take care of it. Better yet, move the shade occasionally. It is also a good idea to occasionally move the shelters, feeders and waterers to a clean spot in the pasture.

Most hogmen find that it is easier to keep fall pigs healthy, particularly those farrowed reasonably early in the fall than is the case with spring pigs. It is usually drier in the fall and it is very easy to farrow the pigs out on pasture. After three months or so free from disease and parasite exposure they are fairly capable of warding off later exposure in their winter quarters.

Certainly the logical way to handle fall pigs is to farrow them on a clean pasture or cornfield which is to be hogged down. Although alfalfa is damaged by too late pasturing, it can be fairly safely pastured until October 15 if excess acreage is provided, say one or two acres per litter.

Keeping the pigs free from infestation after pastures stop growing is a problem. The temptation is to bring them in to buildings sitting in badly infested lots. Such a practice should be strictly avoided. Concrete exercise and feeding floors offer some possibility. Another very simple and effective plan is used on the Ohio University farm. We run the fall pigs all winter on alfalfa which is to be plowed up the following spring, using only small movable houses. We find that thrifty pigs

in good flesh when winter comes are not hurt by low winter temperatures. We do not even bother to bank up around the houses, although that might be advisable in the northern Cornbelt.

The schemes suggested in this article do not by any means cover all possibilities for practicing good sanitation but they do meet the requirements of (1) clean sow at farrowing time, (2) clean farrowing house, and (3) pigs never allowed on soil on which hogs have run during the preceding twelve months.

Sloping Floors Save Pigs

Mashing and crippling of newborn pigs by clumsy brood sows can be greatly reduced by having sows farrow in tilted houses equipped with guard rails on two sides and a "hover" along the lower wall.

When the floor of a farrowing pen is not level, the brood sow usually lies with her head or back upgrade, and the little pigs make their beds along the lower wall, under the hover, which helps to keep them warm and protects them from overlaying. Results are best when the floor slopes about 1½" to the foot. The pig hover (a braced board) should be 10 inches off the floor and extend 12 inches out from the back wall. Very little bedding should be used; otherwise it works down under the hover, clogging the space intended for protection.

The tilted-floor plan works in both individual and central type farrowing houses. On farms with rolling land, the desired floor slope of 1½" to the foot can usually be obtained by setting individual houses on sloping ground. If a slope is not available, houses with floors can be blocked up.—R. W. Pifer.

Fertilizing for Big Yields

Condensed from California Cultivator

R. E. Stephenson

IRISH potatoes that yield 120 sacks an acre are only a fair crop. A yield of 250 sacks on good soils is not an unreasonable expectation in the West. Larger harvests, up to 500 sacks an acre or more, are sometimes reported.

To grow the vines and produce 120 sacks of potatoes, the plants must remove nitrogen equivalent to 555 pounds of nitrate soda, phosphoric acid from 120 pounds of superphosphate and potash equal to 200 pounds of muriate of potash, or a total of 875 pounds of mixed fertilizer, from an acre of soil. A high yield of 480 sacks would require the equivalent of 3500 pounds of fertilizer approximating the formula 9-3-15. Besides the N-P-K of this formula, the large potato crop would use calcium equivalent to 900 pounds of lime rock and sulphur equal to that contained in 375 pounds of landplaster besides some of six other nutrient elements coming from the soil.

These data are not an indication of the amount of fertilizer that must be applied to any particular soil for potatoes. They show that a large amount of nutrient must be provided by good soils in order to produce a crop. Other plants make somewhat similar demands and, if yields are to be pushed to a high level, considerable nutrient, in addition to that supplied by most soils, must be provided. That is the reason for the present popularity of good-grade, commercial fertilizers.

In developing a fertilizer program all soil deficiencies must be corrected before large yields can be expected. Perhaps enough nitrogen is provided but only half enough of some other elements. In this case, the extra nitrogen is wasted because the yields cannot rise above the available supply of the other elements. Intensive farming that removes several large harvests per season from the same soil, demands high rates of fertilizer usage including several nutrient elements, nitrogen, phosphorus, potassium, sulphur and, in certain areas, zinc, boron, manganese and lime for acid soils.

But yields do not depend alone upon fertilizer. Good soils must have favorable physical properties so that roots of the crop can penetrate and function.

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Moisture may be as much of a limiting factor as fertility in determining yields. Using the average figure of 500 pounds of water to produce a pound of hay, a six-ton yield of alfalfa would require 3000 tons of water. An inch of water is 113 tons an acre and 3000 tons is equivalent to about 26½ inches of water which must transpire through the leaves of the alfalfa during the growing season. Water that is lost in drainage or that evaporates directly from the soil, is extra, over and above this amount. The very best soils will hold no more than two inches of crop water to the foot of depth. To produce six tons of alfalfa, therefore, would require that all the crop water be removed from the equivalent of more than 13 feet of good soil. Frequent irrigation will supply the necessary moisture without removing the supply from the deep soil.

But, considering the enormous fertility and water needs of crops for large harvests, it is evident that only superior soils can qualify, even when considerable care is exercised to guard against both nutrient and water shortages. The difficulties are multiplied as the number of crops removed per season increases. Likewise, the inadequacy of fertilizer usage in many areas becomes apparent. One evident reason for a common complaint that yields are no longer as good as they once were, is because of too much crop removal and too little return of fertility.

A specific example of fertilizer practice is the use of up to 3000 pounds an acre of a 3-8-7 mixture by Maine potato growers. This rate supplies 90 pounds of nitrogen—the equivalent of that contained in the vine and tubers of only a little more than 120 sacks of potatoes an acre. Most of the yield above that amount, therefore, must come from the soil, even assuming that the crop is able to secure all the nitrogen supplied in the fertilizer. The mixture contains phosphoric acid enough for more than 350 sacks an acre but, because of fixation by the soil, the crop can obtain not more than one-third of the phosphorus supplied by the fertilizer. The potash content is about equivalent to that required by 220 sacks of crop but part of the potash is also fixed by the soil and, therefore, is useless for increasing the potato harvest.

In this manner, soils compete with crops for nutrients, tying up, at least temporarily, a certain amount of plant foods in forms that crops cannot immediately use. This fixation requires more liberal use of fertilizer than would otherwise be necessary. It is reduced to a minimum by the better methods of placement which put the fertilizer deep enough to

reach moisture and avoid intimate mixing with the soil.

In the light of these data, a 3000-pound application of 3-8-7 for potato production does not seem so liberal. Not every potato producing area would use the same fertilizer formula or the same rate of application, because of soil and climatic differences and, in part, because of differences in experience. The inexperienced grower is usually less inclined toward applying liberal amounts of fertilizer than the veteran.

Effective use depends as much upon the method employed as upon the right selection and rate of application. Fertilizer in contact with the seed or plant may kill the young seedling. The same material, properly placed, may increase the yield several fold. To be effective, fertilizers must be placed deeply enough to come into contact with moist soil. All fertilizer nutrients must go into solution before they can be absorbed by plant roots. Nutrients in solution, if not absorbed by roots, may be washed out of the soil by heavy rains or over-irrigation and lost in the drainage. There is probably some loss of fertilizers under the best conditions.

Effective use of commercial fertilizer, therefore, is not as simple as merely placing it on the field where the crop is grown. The method of placement must be adjusted to the soil, crop and climatic conditions and somewhat in accordance with the character of the fertilizer. Good results have been achieved by distributing fertilizer in the bottom of the furrow behind the breaking plows. This method of placement, called plowsole application, has been especially effective in years that are drier than normal.

Truck gardeners obtain good results from fertilizers placed beside the row, about two inches deeper than the seed, never on or directly over or under the seed or plant. Soluble fertilizers, particularly nitrogen, can be effectively used in solution for side dressing during the growth period. A pint of sulphate of ammonia, or its equivalent, can be dissolved in five gallons of water and this solution distributed beside the row of growing plants. The treatment can be repeated every 10 days or as needed.

Heavy rates of fertilization, necessary for big yields, require more careful placement than lighter rates of use. More than 1000 pounds an acre can seldom be safely used in the row or near the plants. Very heavy rates may be split and part plowed under or placed in the plow furrow. A small amount, perhaps 200 pounds, may be used to advantage in the row near the plants to stimulate growth early in the de-

velopment of the plant. There is much more danger of burn on the sandy soils than on the heavier loams and clay loams, and more care in placement is necessary.

Fertilizers alone, without attention to humus renewal, do not usually give best results. Organic materials improve chemical, physical and biological properties of the soil. Besides regulating the nutrient supply, humus may supply growth hormones and seed germination is sometimes speeded by the presence of adequate amounts of rotting organic matter. Big yields of truck crops make heavy demands upon the soil and often this demand must be met in a short time. Ideal conditions for nutrition of the plant must be provided, as far as possible, or the harvest will be reduced to less than a reasonable possibility.

Milk from Barren Cows

Each year a considerable amount of feed is wasted when dairy heifers prove unable to conceive. With the feed situation as it is today, it is unfortunate that feed is used to raise heifers that will never produce milk. For these reasons, it seemed desirable to determine the possibility of inducting and maintaining lactation by hormone injections.

A 30-month-old Holstein heifer that had proven barren received injections over an eleven-week period. In 228 days this heifer produced 4,791 pounds of milk with an average fat test of 3.8 per cent. The peak daily production was 27.5 pounds.

A 33-month-old Jersey heifer, also barren, was treated for 14 weeks. Gradually she came into milk production. In 305 days she produced 8,045 pounds of milk with a total of 382 pounds of butterfat, making her average fat test 4.7 per cent.

—*New Jersey Agriculture*

Florida Has First Lychee Orchard

Condensed from Florida Grower

WHAT IS THOUGHT to be the first commercial Lychee orchard in the United States is being developed by Col. W. R. Grove of Laurel, Sarasota county. As a result Florida soon may produce commercial crops of one of the world's finest fruits—borne by the Litchi chinensis tree and highly esteemed by Chinese gentry and scholars as the most valued fruit of their country, to which it is indigenous.

Fresh ripe Lychee fruit is about the size and color of a large strawberry. It has a very thin but tough skin which is removed before the fruit is eaten. It is very high in sugar content and has a flavor all its own. The skin of the fruit retains its bright red color for several days after being picked from the tree, and retains this color for two or three weeks under refrigeration. While the color of the skin changes to dark brown within a few days unless under refrigeration, the fruit within is, under normal conditions, not damaged for perhaps ten days or two weeks.

Fresh fruit of the Lychee is almost unknown to our American people, most of the small quantity grown in Florida going to Chinese in our northern cities. When the fruit is dried in the sun or by artificial means it becomes the "Lychee nut" of commerce, presents of which are given by many Chinese - Americans, especially merchants, to their friends and customers during the holidays. The fresh Lychee is as far superior to the dried Lychee as the fresh peach is to the dried peach.

The fruit grows in clusters on trees that may ultimately reach a height of more than thirty feet, with about the same spread. There are many varieties of Lychee. Fruit producing trees of the so-called Brewster variety are growing in approximately fifty locations in Florida, ranging from Auburndale to Homestead. Both coasts, the Ridge, Everglades, and Redlands districts are represented, with usually but one tree in each locality. Chinese in America pronounce the Brewster a satisfactory commercial variety. It is from Fukien province on the extreme northern range of the lychee in China and therefore well adapted to Florida. In Florida the Brewster variety fruits from about June 20 to July 20.

Not only is the Lychee a most desirable dooryard tree on account of its fine fruit, but it is a

Reprinted by permission from the Florida Grower

highly ornamental evergreen tree of symmetrical shape. Several times each year it throws out a new growth of wine colored leaves; and when the fruit is ripe its red clusters make a striking appearance.

The Lychee is a sub-tropical tree and when mature withstands about the same frost as the average citrus tree. It appears to prefer a somewhat acid soil and thrives best on reasonably rich soil although large specimens are growing and fruiting on regular Florida citrus soil. Its moisture requirement for best growth is believed to be somewhat greater than for citrus.

Like citrus, Lychee seedlings cannot be depended upon to reproduce true to parentage, and as budding is unsuccessful, Chinese "air-layering" and inarching are depended upon for exact reproduction. It usually requires from four to six years for layered or inarched trees to bear. Seedlings may require twice that long.

Very young Lychees should be set out in fertile soil and watered more frequently than the average planting. They can utilize at least the normal quantity of fertilizer. Well rotted manure is fine for them. Some shade, such as cheese cloth, is desirable the first summer, until the trees get a start.

5,000 Turkeys on One Acre

Condensed from Kansas Farmer

Dick Mann

A SYSTEM of management and ingenuity that permits raising 5,000 turkeys on a single acre has been perfected by J. D. Averill, proprietor of the Averill Turkey Farm in Cherokee county, Kansas.

This turkey specialist has made such an outstanding success in the business that he now has a profitable sideline teaching others his methods.

Turkeys are raised in confinement in specially designed shelters and sanitary runways which keep them off the ground from birth to market. Each of the large units is 20 by 100 feet and as many as 2,000 turkeys can be raised on a lot 50 by 100 feet, or 100 in a space 10 by 20 feet.

Shelters are simple in design, face the south, and have only a canvas drop for protection

Reprinted by permission from the Kansas Farmer, Topeka, Kansas, Sept. 16, 1944

against the weather. Floors are made of specially designed slats rather than wire, as Mr. Averill claims wire floors cause sore feet and crooked breastbones.

Batteries of feed hoppers are attached to the outside of the pens and are open for self-feeding. They are covered with lids and can easily be filled once a day from the outside.

Mr. Averill says he never has had a case of blackhead in his flocks because of the sanitary program followed. Other advantages to his system include ease of management—one man can care for up to 5,000 turkeys—and freedom from predatory animals. Coyotes or other animals cannot get turkeys on the Averill farm. The owner also claims that the birds are more tender, bringing a better price on the market, and dress out more evenly than range turkeys.

Three toms are kept for each 25 hens and are used alternately with a change in toms every 3 days. Hatching eggs form a large part of the Averill program and better production of eggs of higher hatchability is obtained under this method. About $10,000 worth of eggs were sold this year, mostly to hatcheries in Pennsylvania and Ohio.

An experiment on a new breed of turkey is being carried on this year. The new turkey, named Nittany, is a cross between the wild turkeys found in the Nittany mountains of Pennsylvania and the Broad Breasted Bronze. It is a family-size turkey, with the hens maturing at 7 to 9 pounds and the toms at 12 to 15 pounds. Other turkeys raised normally are White Hollands, Bourbon Reds and Broad Breasted Bronze.

Mr. Averill got into the turkey business via the back door when he started a cafe in Columbus and decided to serve turkey on the daily menu. Finding it difficult to buy turkeys regularly of the quality desired he started raising them on a small scale. Being a man of ideas he did a lot of experimenting and was so successful he abandoned the cafe for a full-time turkey-raising enterprise.

So noteworthy has become Mr. Averill's success that other turkey breeders have come to Columbus from all over the United States just to view at firsthand the equipment and methods used.

Custom Potato Spraying Hits Its Stride

Condensed from Extension Service Review

E. S. Shepardson
Extension Agricultural Engineer, New York

CUSTOM potato spraying has hit its stride in New York State through the successful use of the tractor mounted 10-row sprayer and water supply tank truck. More than 75 custom spray outfits were in operation this spraying season, protecting more than 18,000 acres for more than 3,500 growers.

Spraying has become an essential operation in New York State potato production. Fifty-three percent of the acreage is grown by 93 percent of the growers on farms with small potato acreages per farm, who cannot afford to own spraying equipment individually. Custom spraying has been a lifesaver to them by providing better insect and disease control than they could provide as individuals.

Three years ago, there were 16 custom spray rings in the State. Last year, there were 18 new outfits added to the 16, making 34. This figure will be more than doubled this year with more than 75 rings. The Department of Agricultural Engineering has followed this work very closely and was instrumental in getting this equipment into the State and, probably more important, was instrumental in seeing that the equipment gave satisfaction to those using it.

A handbook for operators of potato spray rings was prepared by the potato commodity committee of the Extension Service and proved exceedingly useful. Members of the State extension staff cooperated in putting out this handbook. The assistant State leader of county agents told of the plan and the need for it; the costs of operating were discussed by the department of agricultural economics; care of equipment was explained by the agricultural engineers, blight and its control by the plant pathologist, and potato foliage insects by the entomologist, with further contributions from the department of vegetable crops. How a custom spray ring worked out in one county was described by County Agent W. E. Field, of Onondaga County. The handbook was a compendium of ready information which brings together the information needed by anyone interested.

As soon as there is an indication from the field that a group of farmers wish to have potatoes sprayed, the county agricultural

Reprinted from the Extension Service Review, Washington, D. C., Sept., 1944

agent calls the meeting, and the facts regarding the custom spraying practices are presented. The ring is formed, directors elected, and then the operator is appointed by the directors of the ring. A 3-year agreement is entered into between the operator and the growers of the ring to apply a specified number of sprays, usually six to eight, during the season at 7- to 10-day intervals, depending on blight conditions, on a specified number of acres for the 3-year period. The ring acreage ranged from about 175 to as high as 300 acres; 225 acres being a good acreage for the ring. The price per application per acre varies from $2 to $3, including the spray materials and is collected by the operator after each application.

Most equipment at the present consists of a large tractor, with 11 by 38 10-ply tires on the rear and 7 by 16 6-ply truck tires on the wide front end. A 30- or 35-gallon-per-minute pump, and booms are mounted on a framework at the back end of the tractor; and narrow deep, 150-gallon tanks are mounted close to each side of the tractor. 1944 outfits are on a framework which lifts off the tractor, with 1 tank in back and the pump and booms in front of the tractor.

The part of the spray equipment that is often forgotten about when custom potato sprayers are mentioned is the water supply tank truck and pump. This is a very important piece of equipment with the spray outfit, as the sprayer must be kept supplied with water or it will sit idle. The sprayer cannot sit idle if the circuit is to be made on schedule. A 700- to 1,000-gallon water tank is usually used and mounted on a 2-ton truck. A centrifugal or rotary pump, with a capacity of 100 gallons per minute against a 50-foot total head, is mounted on the truck to fill the tank on the truck and to draw the water from the truck tank to fill the sprayer tank.

A new type of boom is coming into popular use on the custom potato spray rings. It is referred to as the brush-type boom; and all nozzle openings are in the same horizontal plane, with the exception that the two outside nozzles of the three nozzles per row are swung down slightly and aimed toward the row for the smaller plants. An extra nozzle on each end of the boom to prevent streaking is also used. It has been found that the brush-type of boom saves a great deal of time in sprayer operation because it does away with the constant adjustment necessary with the old Nixon-type boom.

What's New in Alfalfa

Condensed from Successful Farming

H. M. Tysdal
United States Department of Agriculture

"WHY does my alfalfa kill out so soon?" is a question frequently asked by growers. The question becomes more persistent as the acreage of alfalfa continues to expand and increasing reliance is placed upon it because of shortages in other feeds.

There are many answers to the question of why alfalfa kills out, but among the most important are the two arch enemies, winter killing and the bacterial wilt disease. The best way to combat these two enemies is to grow the right varieties.

One is Ranger, a new wilt-resistant variety. It was produced by breeding and selection within the varieties Cossack and Ladak and the Turkistan introductions, obtaining most of its wilt resistance from the latter. Ranger was produced in the co-operative breeding program between the Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture; and the Nebraska Agricultural Experiment Station. After being tested in over 40 different states and in two Canadian provinces, this variety was released for commercial distribution in the fall of 1942.

The largest Ranger increase has been in the states of Montana and Nebraska, and the crop improvement associations of these states will be able to supply substantial lists of seed producers by the fall of 1944.

In experimental tests, Ranger has definitely shown that it is more wilt resistant than commercial varieties now available. It yields about the same in forage as other standard varieties, but where bacterial wilt is severe it has proved its ability to maintain a stand and outyield other varieties. In tests at the Wisconsin Agricultural Experiment Station in the second year from seeding, the stand of Ranger was 68 percent, while the stand of Grimm was 10 percent, and that of Hardigan 4 percent. The latter two varieties are sufficiently winter-hardy for Wisconsin conditions but are not resistant to wilt. At the Iowa Agricultural Experiment Station at Ames, Ranger

Reprinted from Successful Farming, Des Moines, Iowa, July, 1944

yielded 3.55 tons per acre compared to Grimm yielding 2.47 and Dakota Common 1.94 tons per acre in the third crop year. In short rotations, Ladak and Cossack alfalfa may be expected to yield as well or slightly better than Ranger.

In seed production Ranger has been slightly higher in yield than most other standard varieties and two or three times higher than the Turkistan types such as Hardistan and Orestan. Ranger is recommended thruout the northern United States where bacterial wilt is a serious factor. The variety is somewhat more susceptible to leaf-hopper yellowing and to leaf spots than Grimm and therefore should not be sought for planting in the eastern part of the country where short rotations are desired or where bacterial wilt is not serious. In many of the irrigated sections of the Northwest, Ranger should find a valuable place.

Buffalo is another new alfalfa variety, developed co-operatively by the Kansas Agricultural Experiment Station and the United States Department of Agriculture. It is resistant to bacterial wilt, and in tests thruout the country it has shown about the same yielding ability as Kansas Common when both have equally good stands. Where wilt thins the stands, it yields much higher. For example at Ames, Iowa, it yielded 3.60 compared to 1.75 tons per acre for Kansas Common. At Manhattan, Kansas, it yielded 4.31 compared to 3.59 tons per acre for Kansas Common. The Iowa yields were obtained in the third crop year, those at Kansas in the second crop year where wilt was already reducing the stands of susceptible varieties.

Buffalo is compared to Kansas Common because it is adapted to the same areas of the country, which means about the same latitude as Kansas across the country, southeast from that state. It is not as cold resistant as Ranger or Grimm and is therefore not recommended for the northern regions of the country.

Several other new alfalfa varieties are being increased. One has been named Atlantic by the New Jersey Agricultural Experiment Station, where it was produced by selection within several varieties. It is well adapted to the eastern United States and has been at the top of the standard varieties in forage yield when all have equally good stands. Unfortunately it is not resistant to bacterial wilt, tho it is somewhat more tolerant to the disease than some of the standard varieties such as Grimm and Hardigan. There were only eight pounds of seed of this variety in 1943, but it is being increased on a field scale this year.

While most up-to-date alfalfa

growers know about the two arch enemies, winter injury and bacterial wilt, many do not realize the tremendous toll taken by winter injury when unadapted varieties are planted where they cannot "take it." Recent investigations have shown that from July 1, 1942, to June 30, 1943, over 1,900,000 pounds of alfalfa seed were shipped from the southern states to northern states, including Idaho, Wisconsin, and Ohio. This seed was definitely not adapted to these areas, and planting such seed in the north resulted in a sum total of less feed and food for freedom. In a bulletin just off the press, the Pennsylvania Agricultural Experiment Station reports that the hardy, variegated varieties yielded 2.73 tons of hay per acre as an average of nine years of testing while unadapted, southern strains yielded 1.62 tons per acre. On the other hand, in the South the southern strains yield best.

Experiments have shown that northern adapted varieties can be grown one generation in the South without change in adaptation. Therefore first-generation certified seed of northern varieties grown in the South may be expected to be suitable for northern planting. At the International Crop Improvement Association meetings in Chicago last December, plans were adopted to handle and properly identify such seed. In providing this type of seed, state certifying agencies are performing a real service in supplying badly needed northern-adapted seed to the benefit of both northern alfalfa growers and southern seed growers.

Different strains of alfalfa cannot be identified by their seed and there is no way of determining the variety except thru the history of the seed. State-certified seed, however, is a guarantee of trueness to variety because state certifying agencies keep historical records of each field.

The other arch enemy of alfalfa, bacterial wilt, is caused by the organism *corynebacterium insidiosum*. It is gradually spreading and today it is serious in most areas of the country where alfalfa grows well, particularly in the central United States. It is essentially a disease of vigorous, rapidly growing alfalfa and is usually not so severe or not present at all where alfalfa becomes stunted because of drought during the growing season, or where soil or climatic conditions make for poor yields. Thus it hits where alfalfa growing is most profitable and important.

Good management practices (such as cutting from the tenth- to the quarter-bloom stage and leaving high root reserves to go into the winter) tend to make the disease less serious. It was clearly demonstrated that only by the

use of resistant varieties would it be possible to combat the disease. And it was found that some of the alfalfas from Turkistan, Asia, were resistant to the disease. The United States Government sent the late H. L. Westover into Turkistan to find these resistant sorts, and numerous strains were brought back.

Improvement in varieties will continue and new, resistant types will be needed. For example, only last year a serious disease in the southwestern states was found to be caused by a rhizoctonia fungus. So again plant breeders and other technical workers were called in to do a job. And you may be sure they'll continue to work heads off to keep alfalfa "queen of the forage crops."

Lime Worth $39.50 a Ton

Sour soil is one of the biggest cheaters in agriculture. As proof, look at returns from 2 sets of plots near Maysville, Kentucky, supervised by the state experiment station. Between 1913 and 1920, one series of plots got 4½ tons of lime an acre that ranged in fineness from dust to particles a quarter inch in diameter. The unlimed plots since then have returned products that lack $177.75 an acre of matching those produced on limed land. That makes lime worth $39.50 a ton. Those figures are based on crop prices less than half those of the present time — 50-cent corn, 75-cent wheat, $10 hay. Recent tests show there still is enough lime for maximum production.

—Capper's Farmer

The Post-War Pig

Condensed from Farm Journal and Farmer's Wife

Ray Anderson

THINGS are being done to the American hog these days. He is being re-designed, streamlined, in the direction of less lard and more lean.

The men who are planning to produce him are aiming toward a middle-of-the-road type. The new hog will have its tail setting raised, its ham plumped and rounded down toward the hock, its loin thickened and lengthened, its side lengthened and deepened, its back fat thinned, and its legs shortened. (Remember just a few years ago when we thought we wanted hogs "on stilts?")

This means a hog 40 to 42 inches long from behind the ears to tail, 11 inches wide at the shoulder, and 14 to 16 inches deep in body. Such hogs, when they weigh 200 to 230 pounds, should carry a back fat covering of not more than one and one-half inches.

Most farmers understand how hybrid corn is produced— by inbreeding two strains and then by crossing the inbreds. This is the major method the hog experimenters also are now following. Some of these attempts are within a breed. Thus at Iowa State College Poland Chinas have been used. Elsewhere Chester Whites, Durocs and Yorkshires have been tried. In still other experiments inbred strains of Landrace (a Danish breed) and Tamworth have been crossed, also Landrace and Black Hampshires, Landrace and Poland Chinas, etc.

For some time we have known that cross-breeding of ordinary pigs has proved profitable. "Whether these new *hybrid* hogs will be enough better to pay for their added cost remains to be seen," says Jay Lush, of the Iowa State College Animal Husbandry staff. "It looks promising."

The cost would be higher because it would be necessary for breeders to inbreed several times before the hybrid cross could be made. Whether farmers will some day buy these inbred boars and sows, as they now buy hybrid seed corn cannot yet be predicted, but it's possible.

All of this work with hogs stems from the USDA Agricultural Research Center at Beltsville, Md., and centers on a half-section USDA farm near Ames,

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Iowa, where seven years ago the Bureau of Animal Industry established a regional swine breeding laboratory. Co-operating stations are in Minnesota, Missouri, Nebraska, Indiana, Illinois, and Iowa.

Most of the state stations were experimenting in hog breeding even earlier. Several still have independent projects. Illinois, for instance, is experimenting with wild hogs to see if their predilection for belly fat rather than back fat can be transferred in part to domestic hogs. Ohio, Wisconsin, North and South Dakota, Kansas, Michigan, Montana and some of the southern states also are doing things with pigs.

Also helping to remodel our hogs have been the "type conferences" staged by various breed organizations. Two big meetings were held in August, one at Memphis, Tennesse, and the other at Austin, Minnesota. In addition, many hog shows are now preceded by meetings of special type committees—usually a packer-buyer, a college hog specialist, and a breeder.

Why all this pig furore? Simply because lard is a problem. Here's why, as W. A. Craft, Director of the Ames Swine Research Lab, explains:

"A 230-pound hog of present type yields approximately 133 pounds of pork and 36 pounds of lard, or enough meat for two persons a year and enough lard for three persons." Craft believes the experiments he directs will eventually decrease lard on a 230-pound hog by four to six pounds and increase the lean by the same amount.

The economic importance of such a potential achievement indicated by H. H. Kildee, Dean of Agriculture at Iowa State College, who says:

"With average market hogs from the Corn Belt yielding 15% of their live weight in lard, a drop of one cent in the wholesale price of lard means a reduction of 15 to 18 cents a hundredweight in the selling price of hogs."

Since 1938 the price of lard has been lower than the price of hogs more times than it has been higher, and right now lard is a drug on the market. Consumers (including Lend-Lease, other exporters and soap makers) haven't been taking lard this summer as fast as it was produced. Lard in storage has been at a record high. Part of the present glut is due to tangled transportation. The situation should improve fairly soon, perhaps has started improving already since a sharp reduction in hog numbers is under way.

But that will be temporary. As soon as the war is over, imports of South Pacific oils will be resumed to augment supplies, and from a new foreign source, Brazil. The problem child, lard, will be

back in the hog producers' laps when the war ends, perhaps sooner.

Consumption of lard has gained in recent months. Quality, too, has been improved remarkably the last three years. But that's a story by itself, a proud story with great credit to the packing industry, the American Meat Institute, the National Livestock and Meat Board, the United States Army and the USDA's Regional Research Laboratory near Philadelphia.

It is true that thousands of hog feeders also grow a vegetable oil crop (soybeans, flax, cottonseed, etc.) and use the oil meal with grain to grow more hogs to yield more lard. It's a kind of vicious merry-go-round, and a prime reason why the American hog is being made over.

The speed with which any change will come will depend, of course, on whether the consumer will pay more for this new type of hog. The man in the middle is the packer. "Mine run" buying of hogs has been a stumbling block to rapid development of meat-type hogs.

A few packers are pioneering in attempts to buy on a carcass-quality basis. If this becomes general, the post-war, lean-meat type of hog might come on in a hurry.

Moving Balky Cow

When breaking a cow to lead, she will often lie down and refuse to get up, and the same thing may happen when you try to load cattle in a truck. She will get up quickly when the palms of the hands are placed over her nostrils with the fingers under the jaw, tightly enough to stop her breathing. —*Ohio Farmer*

Speed Sprayer Is Big Labor Saver

Condensed from Science for the Farmer

F. N. Fagan, D. E. H. Frear, and H. J. Miller

The Pennsylvania State College Agricultural Experiment Station

THE speed sprayer seems correctly named. Orchardists who have used it agree that it is a labor-saving device which provides for speedier and more timely application of insecticides and fungicides than was heretofore possible.

These advantages appeared so important as a result of wartime labor shortage that trials of the usefulness of a speed sprayer in comparison with that of an ordinary high-pressure outfit were started in the Pennsylvania Agricultural Experiment Station orchards last year. These trials indicate that the speed sprayer definitely hastens spray applications.

From the standpoint of a practical orchardist, our results with a speed sprayer in 1943 were very good. A heavy crop of fruit that was almost entirely free from insect damage and which suffered very moderately from disease was harvested from trees sprayed with the new outfit. Labor costs of spraying were approximately cut in half, and sprays were applied more promptly than ever has been possible with a high-pressure machine. However, residue tests show that spray coverage was not as good in the tops as in the bottoms of the trees.

So far as is known at present, the speed sprayer does very praiseworthy work on fairly open trees which are not too high. Some speed sprayer users have deemed it worthwhile to "top out" their largest trees with a high-pressure rig after spraying with the speed outfit. Fruit growers must remember that this is an entirely new type of machine and workers must learn how to use it.

A thin coverage of spray materials in the tops of trees is not likely to be of serious importance for a year or two, but it might allow a disease infection or insect infestation to build up over a longer period. The trees on which the tests were made were admittedly large; the Staymans were around 24 feet tall and the McIntosh 30 feet. Trees with relatively open tops lent themselves better to speed spraying just as they do to high-pressure "gun" or "broom" spraying. An orchardist can reduce the height

of his trees by pruning; he can open them up so that they can be sprayed more thoroughly, no matter what kind of equipment is used.

The speed sprayer in use at the Station consists of a 500-gallon agitator tank from which the spray mix is forced by means of a rotary pump developing 40 to 50 pounds of pressure. The spray comes out of 86 nozzles arranged in banks at the rear, most of the nozzles being only slightly lower than the tank rim. A draft of air supplied by a fan of airplane propeller type lifts and blows the spray in fog-like form up and through the trees. A 76-horse power motor is required to drive the propeller at 2400 revolutions per minute.

As received from the factory, the speed sprayer did not have the narrow rim and hood attachment. These were put on by a local tinsmith according to special plans. Although they appeared to direct the angle at which the spray was delivered, they were not put on until the middle of the spraying season and no attempt was made to measure their effectiveness.

A speed sprayer is of itself a fairly expensive piece of equipment, and a "feeder" tank truck to haul spray mix to the orchard is necessary if the sprayer is to be kept in anything like continuous operation. A 500-gallon tank load often was applied in 20 minutes, at the rate of about 1 tree per minute. With the high-pressure "broom" outfit no additional supply tank was used since the haul was relatively short. The records show that under these conditions 2 men with the speed sprayer working on trees which required from 12 to 20 or more gallons per tree could do 2 to 2½ times as much work as 2 men with the high-pressure rig. As might be expected, wide variations in speed of application occurred when either outfit broke down or experienced trouble.

The trials also gave emphasis to the necessity of an adequate water supply wherever a speed sprayer is put to work. An average of 2.3 more gallons of spray per tree was required with the speed sprayer than with the high-pressure outfit. This additional gallonage is not so important in itself, but the speed sprayer not only demands more water than a high-pressure rig but requires it faster for continuous operation.

Analyses of spray coverage in terms of milligrams of lead per square meter of leaf surface showed that the high-pressure sprayer produced a statistically significant higher deposit on leaves in the tops of the trees than did the speed sprayer. This was the rule throughout the season on both varieties of apples. On the lower leaves the speed

sprayer produced the greater deposit in 5 out of 8 cases with no significant differences in 3 others.

The Stayman trees showed no scab infection on July 13 and the fruit remained free from this disease. Leaves from the tops of the McIntosh trees sprayed by the speed sprayer had significantly more scab than those sprayed with the high-pressure rig. There was no significant difference in scab infection of leaves from the bottoms of the trees.

At time of harvest, 300 fruit each from the top and bottom of the McIntosh trees were examined for apple scab. The top fruit from trees sprayed with the speed sprayer showed 16.1 per cent infection while the top fruit from trees sprayed with the high-pressure rig showed only 7.8 per cent infection. Corresponding percentages from the bottoms of the trees were 1.5 and 0.9, respectively. No codling moth injury was found on the fruits of either variety.

Calf Scours Capsule

Research work at Wisconsin Experiment Station has shown that vitamin .deficiency is the principal cause of calf scours. Paul H. Phillips, bio-chemist at the station, suggests as a preventive a vitamin capsule containing 5,000 International units of vitamin A, 50 milligrams of niacin, 250 milligrams of ascorbic acid and 200 units of vitamin D. Processors, using the latest improved technique, now can put all these in a single sealed capsule that will preserve potency of the materials for a year or more at room temperature. These are being stocked by veterinary supply houses. Phillips recommends 2 such capsules a day as treatment in acute cases; 1 daily as a preventive.

The old-time farm remedy—3or 4 raw eggs daily, beaten and mixed with the calf's milk—is all right if the cause of scours is vitamin A deficiency, according to Phillips, but eggs are low in niacin and will not do the trick if the scours result from lack of that element.

—*Capper's Farmer*

Is Self-Feeding of Brood Sows Possible?

Condensed from The Farmer

IS it possible to self-feed brood sows during the winter?

With some reservation, the University of Minnesota says it is, and so another farm chore is in process of being lightened.

The University is not as yet willing to go all the way and say that self-feeding of brood sows should become a general practice. The results which they obtained from the experiment conducted during the past year with gilts are reasonably conclusive, but Professors Peters and Ferrin, who conducted the experiment, feel that some further work is necessary with brood sows before they can be sure it will work with mature animals.

Few, if any, hog producers have self-fed brood sows because such animals allowed to eat all they care for become too fat and farrow weak litters. The experimenters sought to overcome this by feeding a very bulky ration containing a high proportion of fibrous feeds such as ground oats and alfalfa meal. Two groups of gilts were fed. One lot of 10 was hand fed a mixed ration consisting of 67% ground yellow corn, 26% ground oats and 7% dry rendered tankage. Leafy alfalfa hay was fed to this lot in a rack. The amount of concentrate was limited in order to force the gilts to eat as much of the alfalfa hay as possible.

Another lot of 12 gilts of similar age, weight and condition was self-fed. Their ration for the first 49 days of feeding was a mixture of 53% ground corn, 20% ground oats, 20% alfalfa meal and 7% tankage, all mixed together so that there would be no opportunity for choice. This rate of feeding resulted in a gain of about 1.5 pounds daily, which if continued would make the gilts entirely too fat. And so for the last half of the feeding period the self-fed group was cut to 33% corn, oats raised from 20% to 30%, alfalfa meal raised to 30% and tankage remained the same at 7%. Both lots were fed a complex mineral mixture.

There were no marked differences between the two groups in the number of pigs farrowed and saved. The 10 gilts in the hand-fed lot farrowed six weak pigs and none dead. In the self-fed lot of 12 gilts, nine weak pigs were farrowed and five were dead at birth. The University authorities conclude that self-feeding of

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gilts at the rate of 43% corn, 25% ground oats, 25% alfalfa meal and 7% tankage would be about right. However, they say: "This is a preliminary report only. The comparison of hand and self-feeding will be continued in order to get average results for a period of years.

Another experiment reported upon was a continuation of the research into the problem of the correct level of protein feeding. Protein is the most essential of all feeds for growing animals and it is also the most scarce and expensive. An experiment, running slightly over three months, was conducted to study the effects of feeding different percentages of protein to growing hogs. Seven lots of 10 pigs each averaging 50 pounds in weight at the start were used and fed on concrete floors. No. 3 ground yellow corn and alfalfa meal made from No. 2 hay were fed in all rations. Dry rendered tankage, 60% protein, and soybean oilmeal, 44% protein, were fed 50-50 with the total amount adjusted to make up the desired percentage of protein in the ration for each lot of pigs.

The percentage rate of protein feeding ranged from 18% of the total ration down to 12%. One lot of pigs was fed 18% protein throughout the entire period. The 18% ration consisted of 70% ground corn, 10% alfalfa meal, 10% tankage and 10% soybean oilmeal. The 15% ration consisted of 77% ground corn, 10% alfalfa meal, and 6.5% each of tankage and soybean oilmeal. The 12% ration consisted of 85% ground corn, 10% alfalfa meal, 2.5% tankage and 2.5% soybean oilmeal.

The lot that was fed at the 18% rate attained a weight of 183 pounds and consumed 371.56 pounds of feed for each 100 pounds of gain at a cost of $9.06 per 100. The lot fed at the rate of 12% all through averaged 165 pounds and consumed 410.54 pounds of feed for each 100 pounds of gain at a cost of $9.39 per 100. The best doing lot was the one that received 18% protein up to attainment of 100 pounds in weight and 15% thereafter. This lot averaged 191 pounds at the end of the trial and consumed 376.4 pounds of feed per hundred pounds of gain at a cost of $9 per hundred. The lot that made the cheapest gains was fed at the rate of 15% protein throughout. This lot averaged 180 pounds at the end of the trial and 367.87 pounds of feed per 100 pounds gain at a cost of $8.69 per hundred. Another lot, which did very well, received 15% protein up to attainment of 100 pounds of weight and 12% thereafter. This lot averaged 183 pounds at the end of the rial and consumed 383.65 pounds of feed

per 100 pounds of gain at a cost of $8.88 per 100.

The principal conclusion to be drawn from these results is that a straight protein ration of 18% throughout a feeding period is higher than need be and that similarly a straight ration of 12% is too low. Young growing animals require the most protein. As they increase in age, the need for protein diminishes. This is the reason for varying the amount of protein in this experiment according to the weights and ages of the pigs.

Undercover Farming

Condensed from Capper's Farmer

M. N. Beeler

WATER that soaks into the ground doesn't run away to erode soil and make floods. Recognition of that obvious fact was the beginning of a new system of tillage, planting, cultivation and rainfall management worked out by F. L. Duley, U. S. Soil Conservation Service, and J. C. Russel, agronomist, at the Nebraska College of Agriculture. That system stores more moisture in the soil, reduces runoff and increases crop yields.

They learned that rain drops falling on bare land soon change the surface texture. After a few minutes of intense fall, a compact layer begins to form which retards intake of water and which resists infiltration more and more as the fall continues. The layer, about one-sixth inch thick, is not the same as the crust which prevents seedlings from coming up.

They learned also that any kind of cover, such as grass or crop refuse, slows or prevents development of the compact layer. Their problem then was to find a way to till, plant and cultivate so that straw, stalks, stems and other trash would be left on the surface. New equipment had to be developed. It consists of a subsurface tiller, of which several types were available when war broke out; a treader which is a special type of rotary hoe with wheels reversed to firm subtilled soil from beneath upward; a specially modified drill and corn planter which put seed below old crop refuse; a cultivator

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which will work row crops without burying the cover.

Subsurface tilling has been adopted by many wheat farmers. A few are employing the principles in growing other small grains and row crops.

On the Nebraska College of Agriculture farm is a 2½-acre field that hasn't had a moldboard plow, a lister, a disk or a drag harrow in it for 14 years, yet it has produced a crop every season. It had been set to alfalfa years when Duley obtained permission to work it under the new system. The topography contained 2 slopes and a swag or swale, which dictated contour tillage and planting.

The first year a seedbed was prepared with subsurface tiller and treader. The field was topdressed with straw and planted to sorghum which made 65 bushels of grain and 3 tons of stalks an acre. The second year the seedbed was again subtilled with stalks left on the ground and sorghum was planted. The yield was 40 bushels of grain and 2 tons stalks an acre. Oats planted under the refuse made a "good crop" the third year. Corn grown under oats stubble in 1943 averaged 104 bushels an acre. The field is in corn again this year, tilled, planted and cultivated under the heavy crop of stalks produced last season.

"There hasn't been a time in 14 years when the land wasn't well protected," said Dudley, "first during 9 years by alfalfa sod; second, during 5 years by residues from the preceding crop. Every operation in working the land and planting has been done with the new equipment—subsurface tiller, treader, modified drill or corn planter and the sweep cultivator."

In another case comparative yields for 2 years show an advantage for the new method. In 1939 rye on plowed land without residue made 29.8 bushels an acre, while on subtilled land with residue it made 35.9; for wheat the yields were 10.5 and 22.3 respectively; for corn, 10 and 18.5. In 1940 corn produced by old methods yielded 30.1 bushels an acre and by the new, 33.3; sorghum yielded 28.4 and 36.5 respectively; wheat on fallow, 30.6 and 42.8; oats, 45.8 and 45.9.

Size Is Important

Condensed from The Ohio Farmer

Ray T. Kelsey

SIZE may not be the most important factor in the production of meat animals but a reasonable amount of scale certainly helps a lot in the feedlot and usually makes a difference on the profit side of the ledger when the animals go to market. That just about sums up the thinking on the subject of the men in the Animal Husbandry Department at the Ohio Experiment Station and they base their conclusions upon the results of experiments in breeding and feeding cattle, hogs, and sheep at the Station.

Back in 1939 Paul Gerlaugh, chief of the Department and who handles the beef cattle work particularly, decided that he wanted more first-hand information on cross-breeding Herefords and Angus. He figured that since the hog men had demonstrated that cross-breeding produced a hybrid vigor and other claimed advantages that the same thing might be true with cattle. So he procured 28 Angus heifers and the same number of Herefords, all Ohio cattle and as nearly uniform as he could get them. Then he went out to get a couple of bulls and came back with two good ones, the only difference being in size. The Angus was what most of us would call medium size, and in ordinary flesh would tip the scales at around 1800 pounds while the Hereford would go 2100.

Half the Angus heifers were mated with the Hereford bull, the other half with the Angus, and same procedure was followed with the Hereford heifers. From then on he kept accurate figures on about everything concerning those cows and the calves they dropped such as gestation period, birth weight of the calves, daily gain in the feedlot, dressing percentage when slaughtered, and the carcass grade. He repeated the same experiment the following year, switching the matings just to check any variations due to individual differences.

The figures on these two crops of calves were very interesting. It appeared that the Hereford bull-Angus cow cross was bringing a little better results than the Angus bull-Hereford cow mating,

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and he noticed that the pure Hereford calves were also growthier than the pure Angus. Paul began to suspect that difference in the size of his bulls so he decided to get a new pair and reverse this factor of scale. This time the Angus that he got weighed the 2100 and the Hereford was medium size at about 1800.

With these sires he continued the test in exactly the same manner, only difference being in this size of the bulls, and kept right on tabulating the results of the calf crops. Lo and behold, the figures were just about reversed. The calves, both crossbred and purebred, from the big Angus bull began to beat those from the medium sized Hereford just about the same as those from the big Hereford in the two previous crops had outweighed and outdone those from the tidier Angus.

Such results certainly lead to the belief that some size and scale are important and that if you are going in for commercial production of beef cattle you will be just as well off if you shy away from the ultra-neat, tidy-package type of animal even tho this kind seems to win so many of the purples at the fat stock shows. Mr Gerlaugh cited a little history for us about the carlot competition at the International in Chicago. At the first one in 1878, then called the Lake Front Show, the champion load weighed up close to 2400 pounds but since then there has been a gradual decrease in the weight. In 1883 the champions dropped below a ton for the first time, in 1930 below a thousand pounds for the first time. Not since 1925 has a champion load of steers at the International averaged over 1100 pounds. The question that arises now is, has this tendency gone too far?

This trend to smaller, tidier packages of beef on the hoof seems to have been dictated largely by the buyer and the consumer. They should have a lot to say about it for after all the buyers of any product constitute its market, but why shouldn't the producer and feeder of market cattle have something to say about the type and size that they bring to that market? Economy of production must always be an important factor and if the good-sized, rugged ones will grow into beef more economically than the over-neat little fellows then we should have more of the big type.

When we talked on the same subject with W. L. Robison, who handles the swine experiments at the Station, we found him in accord with this general idea. He has been doing considerable cross-breeding and his results indicate that there is more difference due to size and scale of the individual or the breed than from any other factor. In swine breed-

ing the four most important characteristics are the number of pigs per litter saved, the rate of gain, the feed required per 100 pounds gain, and the killing quality of the finished hog. When he crossed one of the so-called lighter breeds with a heavier breed the results in about four out of five tests were not as favorable as if two of the heavier breeds were used. This was especially true of the "rate of gain" and "feed required" factors.

Sunflower Seed Is Good Poultry Feed

Since sunflower seed is a possible wartime substitute for cereal grains in poultry feeding, recently reported tests of its use at the *School of Agriculture, Cambridge, England,* are very timely.

Three groups of pullets were fed, respectively, ½ oz. of sunflower seed per head per day, 1 oz. per head per day, and all they would eat on a free-choice basis (actually 2.7 oz. per head per day for 12 weeks).

There was no evidence of any unfavorable effect on egg production. Palatability tests on the eggs showed them to be excellent in all respects.

When sunflower seed was offered to pullets kept in individual cages—so that there was no competition among the pullets for feed—it was eaten much less freely, showing again that battery management and floor management of layers are not always directly comparable.

Digestibility trials showed sunflower seed to be a good source of both protein and energy. The Hungarian sunflower seed used contained 7 percent moisture, 18 percent protein, 26 percent fat, and 26 percent fiber.

—*Jour. Agr. Sci.*

Cows Can't Synthesize Minerals

Condensed from Certified Milk

Robert L. Quait

Limestone Products Corporation of America, Newton, New Jersey

THE dairy cow occupies her place of importance in agriculture and the nation's food economy, chiefly because of her remarkable ability to convert relatively crude and inexpensive feeding materials into food substances of greater nutritive and market value. This fact is commonplace, but only during recent years have some of the details of how a cow is able to transform simple feed materials into more complex substances been explained by results of research and feeding experiments at the agricultural experiment stations.

The dairy cow manufactures fat, carbohydrates, and proteins of unsurpassed quality from raw materials which are biologically much inferior to the nutrients in her final product, milk; she also fabricates from ordinary feed substances, and puts into her milk rich supplies of vitamins, particularly the many factors of the Vitamin B Complex. A recent, important example of the cow's ability to build up more elaborate compounds from simple substances is the finding that the very simple nitrogen-containing substance, urea, can within certain limits be used as a raw material for the synthesis of the very complex substances, proteins. The synthesizing ability of a cow is the result largely of her unusually complete digestive equipment—which includes four stomachs. It is in the first of this series of stomach compartments, the paunch or rumen, that much of the manufacturing from crude raw materials is carried on with the assistance of millions of skilled food chemists, the rumen bacteria.

The carbohydrates, fats, proteins and vitamins that the cow manufactures are all made up of various combinations of carbon, oxygen, hydrogen, and nitrogen; they belong to the group of chemical substances classed as *organic* compounds. By suitable breaking down and rebuilding an almost unlimited number of these organic materials can be put together by the cow. However, in addition to the organic nutrients required by the cow for both her milk production and for her own

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body maintenance, a number of *inorganic* substances are necessary for the animal's physiological processes. Calcium and phosphorus are required for bone building; iron, copper, manganese, cobalt, and perhaps other mineral elements are required to serve if only as catalysts, to activate the processes by which the hemoglobin of the red blood corpuscles is formed and functions. Iodine is required for formation of thyroxine, an important regulatory secretion concerned in the entire hormonal system; similarly, many other mineral elements—making a total of perhaps 20 or more—are required for various metabolic purposes.

Obviously, the cow's synthesizing ability, her rumen and the rumen bacteria are helpless to supply nutritionally essential minerals even though they can build many of the organic compounds required for the animal's nutrition. Carbon, hydrogen, oxygen, and nitrogen can not be converted into calcium, manganese, iodine, or any other mineral element, any more than the base metals can be converted by the alchemist into gold.

After observing how dairy herds year after year go on producing calves and milk though their diets may consist of relatively crude feed materials there is a danger of coming to expect too much from the cow's synthesizing ability and to neglect proper attention to the content of the ration of calcium and many other inorganic mineral essentials which must be supplied because they cannot be manufactured.

Too often it is taken for granted that the cow can get along well enough if she receives a fair quantity of not too inferior organic materials in her ration. Frequently the error of this assumption is not recognized until outright deficiency symptoms are exhibited, in which case the necessity for attention to mineral nutrition becomes strikingly apparent. In recent years agricultural research has done much to avert this danger by calling attention to the requirement for minerals in the ration through discovering and reporting specific nutritive functions of specific minerals.

Calcium is an outstanding example of an essential mineral which must be supplied regularly and adequately in the diet of the animal. Because the bulk of the body's calcium is found in the bones and in the teeth it is not always realized that calcium, once it is assimilated, is not merely deposited in the bones in a sort of "dead storage", but that there is a constant, day-to-day, minute-to-minute traffic—a two-way traffic, in and out—of calcium, participating in the chemical processes and exchanges of

the living animal body. In addition to the calcium of the bones and the teeth, small amounts of calcium are constantly present in the body fluids, particularly the blood, where it occurs chiefly in the form of calcium ions and as calcium proteinate.

Since calving and the production of milk—one of the richest food sources of calcium—are the major purpose of dairying they also represent two major channels of calcium expenditure. For this reason it is essential that feed mixers and dairymen give due consideration to the mineral composition of the dairy ration.

Cows, unable to synthesize in their rumens the mineral elements as they build up some organic substances, attempt, nevertheless, to guard against danger of a deficiency of certain of these essential feed minerals. For example, recent research has indicated that cows store a reserve of manganese in their bodies during the pasture season, and that this manganese reserve, as reflected in the manganese content of the milk secreted, becomes definitely depleted as the winter season proceeds. The importance of manganese in both animal and poultry nutrition is well established, and the experiments indicating that cows store this mineral when it is present in sufficient amounts in the ration, further emphasize its nutritional significance—and the necessity that it be supplied in the diet for both maintenance and storage purposes since rumen or body synthesis of an element is a physiological impossibility.

Certain mineral elements are in themselves indispensable constituents of a number of more complex body-elaborated organic compounds which are essential to animal life. As primary raw materials, such mineral elements are prerequisites for the very processes of certain syntheses. The iron of blood hemoglobin, the zinc of carbonic anhydrate, the iodine of thyroxine, are typical of the inorganic mineral constituents of a number of life-controlling hormones and enzymes, without which all processes of physiological synthesis are impossible. Such minerals can be supplied by the diet, and probably best by the diet alone.

Control of Lice on Cattle

Condensed from Farm Research

John G. Matthysse
Ithaca

CATTLE lice are a serious problem on many dairy farms. In pre-war times, the control of these pests was fairly easy as rotenone effectively kills lice on all kinds of stock. If cattle are thoroly treated with a louse powder containing 0.5 per cent rotenone late in the fall, and once or twice during the winter when lice become numerous again, little trouble should be experienced.

The Japanese conquest of the Netherlands East Indies greatly reduced rotenone supplies so that a search for effective substitutes has been in progress for all uses to which rotenone was put. A large number of insecticides were tested against cattle lice with indifferent results, until an old standby of many New York dairymen was investigated. This was sabadilla.

For many years dairymen have been buying coarsely ground sabadilla seed at drug stores and applying it to their stock with fairly good results. To test sabadilla accurately, samples were finely ground in a rotary hammer mill with pyrophyllite and diluted to 5 per cent and 10 per cent with sulfur. These dusts, and comparison dusts of rotenone and other insecticides were then applied to lousy cattle. A number of tests were conducted so that each dust was tested for efficiency against all species of cattle lice found in New York State. Rotenone gave almost perfect results against all species of lice, and sabadilla approached but did not quite reach rotenone in effectiveness.

Four kinds of lice attack cattle. The commonest and most troublesome in New York State is the little red louse, or biting louse (*Bovicola bovis*). This louse does not suck blood but lives on scurf and scales and oily material on the skin and hair surfaces. It causes much damage, nevertheless, by constant irritation of the host animal. All other lice on cattle are blood-sucking parasites. The commonest of these is the long-nosed blue louse (*Linognathus vituli*). This species is particularly troublesome on calves and heifers. It can be distinguish-

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ed by its long "nose" or rostrum. The largest louse is the short-nosed cattle louse (*Haematopinus eurysternus*) which often causes trouble on mature animals. This short-nosed cattle louse is found more abundantly further south and west, altho it is common enough in New York State. Lastly, there is the little blue louse (*Solenopotes capillatus*) which occurs sporadically thruout the State. It can be recognized by its small and short "nose" or rostrum.

An effective louse powder must control all four species because at least two, and often all four, species infest most dairy herds during the winter. Rotenone and sabadilla will control all species, but other insecticides are effective against some, and not other, kinds of lice. For instance, nicotine is effective against the little blue louse and the short-nosed louse, but not against the little red louse or biting louse; fluorides are effective against biting lice but not against any of the sucking lice. A synthetic insecticide known as phenothioxin was effective against the little red louse and the short-nosed louse, but not against the remaining two species of sucking lice. Another plant insecticide often recommended for louse control is hellebore, but this material was found to be ineffective against all species of cattle lice.

Since supplies of sabadilla are none too great, a combination of more easily obtainable insecticides was sought. A synthetic organic dithiocyanate, known as Lethane A70 or B71, was found to be fairly effective against all species of cattle lice except the little blue louse. Nicotine is very effective against the little blue louse, thus a dust of ¾ per cent nicotine and 5 per cent lethane A70 was tested and found to be effective against all louse species. But this dust was still not quite as effective as sabadilla or rotenone.

The insecticidal uses of sabadilla have been under investigation by other workers, especially Dr. T. C. Allen of Wisconsin, for some time. It has been found to be effective against a number of insects. Peculiarly, freshly ground seeds are not as toxic to insects as older material. This increase in toxicity can be brought about rapidly by heat-treating the seeds, or treating with an alkali such as lime. Such "activated" sabadilla is on the market and ought to prove very effective against cattle lice.

To supplement the work on louse control, investigations into the life histories and habits of cattle lice have been carried out. Success has been achieved in rearing the little red louse thru several generations, off cattle, by feeding on skin products and

yeast under controlled temperature and humidity conditions. It has been found that this louse reproduces parthenogenetically, that is, females lay fertile eggs without sexual mating. In fact, under normal conditions, it is very difficult to find males of this louse, as practically all red lice on cattle are females. The complete life cycle, that is one generation, under laboratory conditions, required 29 days.

Dairymen commonly make the mistake of expecting to control cattle lice by applying a small amount of louse powder along the topline only. Lice do not migrate very much on cattle during the winter so that it is necessary to treat all areas of infestation on cattle. In particular the head, neck, dewlap, brisket, udder, flanks, insides of the legs, tail, escutcheon, tailhead, and topline are areas that must be dusted. It is far better to use several ounces of powder on each animal a few times a year and control the lice thoroly than to apply a small amount along the topline every few days and have louse trouble all winter.

Wild Vitamins

Drug and grocery stores don't have all the vitamins in their packaged wares, according to recent findings of various state agricultural experiment stations. New Hampshire wild blueberries, eaten raw, are found to contain Vitamin C; Massachusetts field mushrooms contain four of the B vitamins; peanuts have thiamine (B-1) as well as high quality of protein. Wild rice is a good source of several of the B's (thiamine, riboflavin, and nicotinic and pantothenic acids), while the lowly buffalo-berry is richer in ascorbic acid (Vitamin C) than the citrus fruits which are among the best fruit sources for this vitamin.

—*N. J. Farm and Garden*

How Cattle Digest Their Feed

Condensed from The Jersey Bulletin

C. L. Blackman

Ohio State University

FOOD is broken down in digestion by physical mascera-tion or grinding, and by the action of enzymes. Enzymes cause the chemical break-up (hydrolysis) of feeds, but do not enter into the resulting products so are available for use again.

The cow is a ruminant (chews a cud). She has four stomachs—or, more accurately, one stomach with four compartments. The total capacity of the stomach may exceed 60 gallons. The first two compartments may hold 50 gallons. The cow is able, therefore, to digest large amounts of rough coarse feed such as hay, stover, and silage as well as concentrated feed such as grain.

The first compartment (rumen or paunch) of a cow's stomach is the largest and acts as a great storage place for feed. The second compartment (reticulum) carries considerable water and acts closely with the first in carrying on rumination (chewing cud). The third compartment (omasum) appears to act more or less as a mascerating or mixing organ. The fourth compartment (abomasum) is the only true digestive stomach, as it is the only one that secrets digestive enzymes.

When the cow first eats her feed, she does not grind it thoroughly. She chews it enough to soften it somewhat and mix it with saliva so that it can be swallowed. The feed then passes to the rumen. Here it is moved about and mixed by the action of this organ. The digestion which takes place here is mostly due to bacterial action and possibly to the action of enzymes which are in the feed itself. The saliva of the cow does not contain digestive enzymes, hence none is added to the feed up to this point.

Most of the digestion of the fiber of feed is carried on in the first two stomachs. There is no enzyme secreted by animals which will digest fiber and hence animals which eat large amounts of coarse feed are provided with a large stomach or intestine where fiber digestion can be carried on by bacterial action.

After the feed has remained in

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the first stomach for a considerable time it is returned to the mouth, about 4 ounces at a time, for a re-chewing—thus the cow chews her cud.

Some studies have shown that a cow may spend 6 hours eating and 7 or 8 hours a day chewing her cud. When the feed is rechewed it passes back to the first stomach again, from here the finer parts pass through the second stomach to the third stomach, and from there it moves on to the true or fourth stomach and later into the intestine.

Investigations show that part of the feed remains in the first two stomach compartments from a few hours to several days, the finer portions and grain passing through first. Some feed materials pass through the cow in 9 or 10 hours.

Fat—Small amounts of fats are digested in the stomach by the action of an enzyme called gastric lipase. However, by far the greatest part of fat digestion occurs in the small intestine. Here the fat is emulsified (made into droplets so small that they will not separate from a mixture) with the aid of bile. The emulsified fat is then acted upon by an enzyme called steapsin (from the pancreas) and converted into fatty acids and glycerol (glycerin). Some of these fatty acids are changed into soaps by the action of the alkali salts of the bile (salts of calcium, sodium, magnesium, etc.). The fat is then absorbed by the lacteals of the villi in the small intestines and carried through the lymphatic system to a point above the heart where it is emptied into the venous system through which it passes to the heart. From there, it is carried by the arteries to the cells of the body where it may be broken down to furnish heat (energy), or built up into body fat, or used by the cow to make the butterfat of milk.

Carbohydrates — In the cow and other ruminants there is digestion of carbohydrates in the stomach. In fact, about 70 per cent of fiber digestion takes place here. This digestion is brought about by bacterial action, as explained earlier. In other animals small amounts of carbohydrates are digested in the mouth by action of the salivary enzyme (ptyalin). The action of ptyalin is continued for a short time in the stomach. In the cow, very little of the carbohydrate material other than fiber is digested by the time the feed reaches the small intestine. The carbohydrates are then attacked by enzymes from the pancreas and the walls of the intestine and changed into simple sugars, in which form they are absorbed by the capillaries (small blood vessels) in the villi of the small intestine. They are carried by the veins to

the liver, where most of them are removed. Here some of the sugars are built up into glycogen (animal starch). Most of the glycogen is stored in the liver (3 to 7 per cent of the weight of the liver may be glycogen) and muscles and given up as needed. A very small part of the carbohydrate is stored as sugar in the body cells, and this source is the first called upon when energy is needed.

The carbohydrates are used to furnish heat and energy to the body and may be changed to body fat. Some of the carbohydrates are used to make milk, milk sugar, and butterfat.

Protein—Protein digestion begins in the true stomach through the action of the enzyme pepsin, which breaks protein into simpler substances called proteoses and peptones. Protein digestion is completed in the small intestine by the action of enzymes from the pancreas and the walls of the small intestines.

Most proteins are broken down into amino acids before they are absorbed. Like the carbohydrates, they are picked up by the blood and carried to the heart by way of the liver. They are then sent out through the arteries to be used where needed to build body protein for repair and growth, and some are used by the udder to make the proteins of milk. If there is an excess of protein material, the nitrogen will be removed from the amino acids and the remainder changed into sugar and fat. These will then be used like the fats and carbohydrates from other sources.

Water—Water requires no digestion and is taken up throughout the digestive tract.

Minerals — Minerals, like water, require no digestion and are absorbed throughout the length of the digestive tract. Their functions are structural and regulatory. The largest amounts are found in the bones and teeth. Minerals are essential in blood building and in carrying on other body processes.

Not all of the feed which cattle or other animals eat is used for productive purposes. In the first place, part of the nutrients in the feed are lost in the process of digestion. Some are lost in the feces and some are broken down into gas and lost. The parts which the animal digests and absorbs are called digestible nutrients.

The digestible nutrients for many feeds have been determined experimentally. Animals have been fed known amounts of feeds which have been analyzed before feeding. Then the feces have been weighed and analyzed. The difference between the amounts of nutrients found in the feed and those found in the feces represent the digestible nutrients. For example, corn meal is about 9.4 per cent protein, but only about

7.1 per cent is digestible protein.

Likewise, portions of the carbohydrates, fats, and minerals are also lost in the digestive process. Some food value is lost by the way of the urine. Some energy is used to masticate feed and force it through the digestive tract. Energy is required for the heart and lung activity. When the animal consumes feed, the body activity increases and heat is developed. Some of this may be needed to keep the cow comfortable, but in any event feed so used cannot be applied to such productive purposes as growing, reproducing, fattening, or producing milk. More than half of the value of concentrated feeds like corn is accounted for in the losses enumerated above.

The losses in the case of roughages (feed high in fiber) such as hay and stover are much greater, because there is a much larger loss of nutrients in the feces. This is due to the fact that the fiber is difficult to digest.

Sale Catalogue Planning Pays Off

Condensed from The Hereford Journal

Lawrence H. Riggs

THE popularity of the public auction sale, as a means of disposing of the products of a breeder's endeavor, has increased greatly during recent years.

Many are the details to which the breeder must give attention in planning a sale, but the purpose of the present discussion is to deal with only one of these, a not inconsiderable one, namely the sale catalogue. Many breeders realize the importance of this item and are willing to give it the attention it deserves. Those who are not aware of the time and effort involved frequently find, too late,that they have slighted a potent factor in the success of their sale.

The purpose of a catalogue is to acquaint the prospective purchaser with the merits of the cattle offered for sale, and any information toward this end is of value. Of the features desirable in a catalogue one might say that accuracy and attractiveness are outstanding. Lack of either of these may lead the buyer to question the seller's interest in his product and even the merit of the product itself. A hastily prepared catalogue might lead to the inference that the seller was presenting a mediocre offering, one not warranting serious investigation.

Aside from their immediate value, as a means of listing cattle offered for sale at a particular date, catalogues are often of more permanent interest. The breeder who annually presents a sale offering has, in his sale catalogues, a record of historical importance, especially if he deals in cattle of superior merit. A catalogue of one sale may lead a prospective buyer to investigate a later offering.

The time required in preparing an adequate catalogue is considerable, and only through first-hand experience do breeders come to this conclusion. Some probably turn the material over to the printers in a disorganized state and then wonder why their catalogues are inaccurate and why they are not on hand long enough before the sale for proper distribution.

Matters of make-up and ar-

Reprinted by permission from The American Hereford Journal, July, 1944

rangement can, perhaps, be left to the judgment and experience of the printers, but all factual information about the cattle should be carefully prepared by the breeder himself, with sufficient checking and re-checking for accuracy. When submitted to the printer this should be in such a form as to minimize the likelihood of error.

Of the several breeders who kindly responded to inquiries regarding their experiences with sale catalogues, John B. Stribling, Rotan, Texas, gives an interesting "time schedule" for the preparation of a catalogue. Summarized it is about as follows, working, as he puts it, "in reverse order" from the sale date. Assuming that the catalogues are to be mailed 15 days before the sale, and allowing extra days for the task of mailing, the printer's deadline is 17 days. Ten days for the actual printing and five days for having cuts made mean that the breeder must submit "copy" 32 days before the sale.

The matter of getting photographs consumes extra time—10 or 15 days for the photographer's work (taking, developing, printing, etc.), with 20 days as a bare minimum in preparing the cattle for his visit (posing, grooming, washing, etc.). This adds 30 to 35 days and totals 67 days before sale date.

Mr. Stribling adds: "Failure on the part of any one of the several specialists involved to do his work promptly and according to plan will throw the whole program 'out of kilter.' " A schedule like the one above can be shortened if few cuts are used and if the breeder leaves the matter of copy reading to the printer. [With reference to the latter point Mr. Stribling says that their practice was to require three proof readings by the printer prior to submitting the material to them for final check. He adds: "We then check proofs against 'dummy.' . . . after which we proof read three times against copy, indicating corrections on the proofs, which are then returned to the printer."]

Catalogues vary greatly in size, ranging from the miniature ones (3⅜ by 5⅜ inches) to the mammoth ones (12¼ by 14¾ inches). But the average seems to be 5¾ by 9 inches.

The majority of catalogues are hinged on the longer side like a book, while others open from the short side. Some breeders use one size and general set-up for successive years, while others change from year to year. Whatever the size it should be convenient for the handler. Anything irregular in shape, or of undue proportions, will be a hindrance to the main purpose for which the catalogue is issued.

Receiving first attention of the

observer is the cover page, which should be both attractive and informative. It need not be elaborate, for a simple block-letter design (preferably in two colors) can fulfill these condition. Yet the use of a picture seems to be favored by most breeders and usually a two-color scheme is advisable. A "spirit varnished" cover makes the picture look like a photograph, and this type of cover has been very popular of late.

Whatever the design used, it should be prepared with care so as not to appear overcrowded and messy. Cost of an attractive two-color design may range from $25 to $50, but the resulting "first impression" will warrant it. If a design can be used from year to year the initial expense is spread over a longer period, and such a cover becomes a sort of trademark for the breeder. Information presented on the cover should include the name of the seller and the date and place of the sale.

The main body of the material beneath the cover should be prefaced by a title page, with the date again prominently indicated, some sort of an announcement, and the terms and conditions of sale. Many breeders overlook the possible value of the announcement. It need not be lengthy, but the inclusion of a well worded, cordial invitation to attend the sale can put the reader in a good frame of mind for perusal of what follows. Brief statements regarding the history of the herd, how it is managed and developed, aims of the breeders and other relevant facts are of added value.

Most breeders precede the pedigrees of the cattle to be sold by pictures and pedigrees of herd bulls, often including sires most influential in founding the herd, in addition to those in actual use at the time.

Whether pictures are used for sale animals or not, it is advisable to have good, up-to-date ones for the herd bulls, especially those whose get or service are featured in the sale. But notice the word "good" in the above statement; a poor picture is worse than none at all. This applies to other illustrations as well.

The bulk of any catalogue is concerned with information regarding the animals for sale, and here the pedigree is the chief item. Various are the forms in which pedigrees may be presented, and the ways in which they may be arranged on the page. Fairly recently the three-generation form has been adopted, in order to save labor and expense in preparation, but most breeders prefer the four- or five-generation form.

A number of sellers like to include in the pedigrees indication

of the breeder of each animal in the first two or three generations.

Attention is often called to highlights in the pedigree through capitalization of names or use of bold-faced type. Frequently names of the sire, and of the sire of the dam, are capitalized, while attention is similarly called to Register of Merit animals or to a sire whose blood is concentrated in the pedigree.

The element of accuracy in pedigrees cannot be stressed too highly, for often the buyer of an animal has no other record of the breeding. He must rely on catalogue information, unless he wishes to go to added expense or to the effort of personal investigation, for which, more than likely, he has neither the inclination nor the necessary data.

Aside from the pedigree itself, there should be additional information. The calving date and tattoo or horn brand numbers are essential, and highly desirable are breeding dates, produce records and indication of the breeder of the animal.

Arrangement of pedigrees on the page varies with the type of pedigree and the size of the book. The average sizes mentioned above admit of two-, four- or five-generation pedigrees per page, or one pedigree and a cut. Frequently the three-generation form is used in this way. It is also possible to get three pedigrees on the page if smaller type is used; and on occasion four per page have been used. The latter arrangement, however, is likely to give a crowded effect, and while conserving space, is not to be recommended under ordinary circumstances.

The type of catalogue which opens on the short side is adapted to a single pedigree per page, in either the four- or five-generation form. If pictures are used they are usually placed on the opposite page, thus devoting two pages to each animal pictured.

Several methods of arranging the order of animals listed for sale have been followed. The ideal way would be to have them in the order of selling, but for various rather obvious reasons this is practically impossible of realization. A conventional plan is to list bulls first, by ages, and then the females, according to age within such classifications as cows with calves at foot, bred cows and heifers, and open heifers.

Other breeders prefer to group the animals according to the sires represented, or according to "families" of the dams.

An index of some sort, if properly prepared, is of assistance; and a good many catalogues include a form for shipping instructions and blank pages for memoranda. A map showing the location of the farm, with the

highways leading to it, is a valuable addition. And occasional pictures of buildings and farm scenes add an individual touch, as do the human-interest pictures of persons connected with the sale, whether they be of breeders or caretakers.

Catalogue printing is a specialized industry, requiring individual techniques in arrangement, typesetting and make-up. As the average printing establishment may not be equipped for efficient production in this field, it is well for the breeder to deal with experienced firms. How much of the responsibility he wishes to place with the printers will depend on his own experience and inclination, but for best results he should familiarize himself with the essential details, whether he personally supervises their execution or not.

Every breeder must decide for himself how much of what he hopes to realize from the sale should be set aside for catalogue production. A poorly prepared and unattractive catalogue may "cost" more in loss of receipts than is saved on the actual bill for printing. On the other hand, a too-elaborate catalogue, when compared with the quality of the cattle offered, may be just as damaging in its effect on buyers and their estimate of the seller's judgment and sincerity.

As in all phases of the complex business of cattle breeding, experience is the best teacher and the wise breeder can save himself a lot of grief if he profits by the experiences of others, adapting them to his own conditions.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3. 1933

of the Farmers Digest, published 11 issues a year at Ambler, Penna. for October 1, 1944

State of Pennsylvania | ss
County of Montgomery |

Before me, a Notary Public in and for the State and County aforesaid, personally appeared A.E.Heick, who, having been duly sworn according to law, deposes and says that he is the busines manager of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor and business manager are: Publisher, L. Bush-Brown, Ambler, Pa.; editor, L. Bush-Brown, Ambler, Pa.: assistant editor, C. Leavitt Dyer, Baltimore, Maryland; business manager, A. E. Heick, Ambler, Pa. 2. That the owners are: L. Bush-Brown, Ambler, Penna.; C. Leavitt Dyer, Baltimore, Md.; A. E. Heick, Ambler, Penna.
3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, A. E. Heick, Business Manager.
Sworn to and subscribed before me this 30th day of September, 1944 (Seal). Mary C. Cassidy, Notary Public. [My commission expires May 1, 1948.]

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Dairy — Beef — Hogs — Sheep — Horses

Condensed from New England Homestead

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The American Shetland Pony Club, Barbara K. N. Ryde, secy.-treas., 4111 No. Sherman Blvd., Milwaukee, Wis.

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American Romney Breeders' Association, H. A. Lindgren, secretary, 200 Dairy Bldg., Corvallis, Ore.

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The American Devon Cattle Club, W. J. Neal, secretary, Meredith, N. H.

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The American Milk Goat Record Association, Fred B. Keefir, secretary, Marshall, Ill. This association registers all breeds of milk goats.

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American Rabbit and Cavie Breeders, Lewis S. J. Griffin, Colorado Springs, Col.

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These books are recommended as outstanding in their field:

An Agricultural Testament—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford University Press. $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Dairy Cattle and Milk Production — By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science — By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D.V.M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition (1943). $3.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Farm Management and Marketing — By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. Publishers: John Wiley & Sons, Inc. (1942). $2.75.

Growing Tree and Small Fruits—By H. B. Knapp, Director, State Institute of Applied Agriculture, Farmingdale, Long Island, N. Y., and E. C. Auchter, Chief, Bureau of Plant Industry, U. S. D. A. John Wiley & Sons. $2.75.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

How to Raise Rabbits for Food and Fur — By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Livestock Judging Handbook — By Julius E. Nordby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.

Modern Agricultural Mathematics — By Maurice Nadler, B.S., A.M. Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. (1942). $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., Agricultural Writer, formerly with U. S. Dept. of Agriculture. Orange Judd Publishing Co., Inc. (1944). $4.50.

Natural Principles of Land Use—By Edward H. Graham,, Chief of the Biology Division of the Soil Conservation Service. Oxford University Press. 275 pages. $3.50.

Plowman's Folly—By Edward H. Faulkner. (1943) Grosset and Dunlap. $1.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Practical Farming for the South — By Benjamin F. Bullock, now Prof. of Rural Education, Atlanta University, Atlanta, Georgia. Univ. of North Carolina Press. $2.50.

Profitable Poultry Keeping — By H. Clyde Knandel, Prof. and Head, Dept. of Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

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Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Roots in the Earth—The Small Farmer Looks Ahead — By P. Alston Waring and Walter Magnes Teller. Harper & Bros. $2.50.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

The American Land—Its History and Its Uses — By William R. Van Dersal, biologist in the United States Department of Agriculture. Oxford University Press. $3.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

The Western Horse—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

BOOK NOTES

BREEDS OF LIVESTOCK IN AMERICA — By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College, Univ. of Minnesota, and Montana State Univ. This book gives facts about the history and development, type, characteristics, properties, and adaptability of breeds of beef cattle, dairy cattle, sheep and goats, swine, horses, ponies and jacks in America. It is a valuable guide for farmers who wish to base their choice of livestock breeds on adaptability to local conditions and on practical, economic considerations.

Publishers: College Book Company 780 pages $3.75

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